

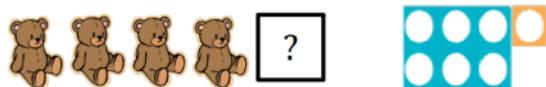
## MONKEN HADLEY CALCULATION PROGRESSION

### EARLY YEARS FOUNDATION STAGE

Children in Reception follow the Early Years Foundation Stage curriculum. They will be given a solid foundation in practical arithmetic upon which to build. Children will develop their number knowledge to 20 through a range of activities, songs and games. They will also explore addition and subtraction through the use of objects and apparatus.

#### Mental calculation

One more of a given number to 20



One less than a given number to 20.

#### Essential Knowledge for ALL children

Count in 1s to 20.

Order numbers from 1 –20.

Write numbers from 1- 20.

One more or one less than a given number to 20.

Add and subtract two single-digit numbers using quantities or objects.

Count on or back to solve an addition or subtraction number sentence.

Counts an irregular arrangement of up to 20 objects.

Practical doubling, halving and sharing.

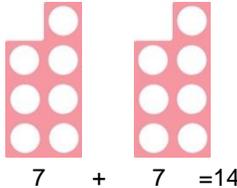
### KEY STAGE 1

Children in Years 1 and 2 will be given a solid foundation in the basic building blocks of mental and written arithmetic. Through being taught place value, children will develop an understanding of how numbers work, so that they are confident with 2-digit numbers and beginning to read and say numbers above 100.

**Addition and Subtraction:** A focus on number bonds, first via practical hands-on experiences and subsequently using memorisation techniques, enables a good grounding in these crucial facts, and ensures that all children leave Year 2 knowing the pairs of numbers which make all the numbers up to 10 at least. Children will also have experienced and been taught pairs to 20. Children’s knowledge of number facts enables them to add several 1-digit numbers, and to add/subtract a 1-digit number to/from a 2-digit number. Another important conceptual tool is the ability to add/subtract 1 or 10, and to understand which digit changes and why. This understanding is extended to enable children to add and subtract multiples of 10 to and from any 2-digit number. The most important application of this knowledge is the ability to add or subtract any pair of 2-digit numbers by counting on or back in 10s and 1s. Children may extend this to adding by partitioning numbers into 10s and 1s.

**Multiplication and Division:** Children will be taught to count in 2s, 3s, 5s and 10s, and will relate this skill to repeated addition. Children will meet and begin to learn the associated  $\times 2$ ,  $\times 3$ ,  $\times 5$  and  $\times 10$  tables. Engaging in a practical way with the concept of repeated addition and the use of arrays enables children to develop a preliminary understanding of multiplication, and asking them to consider how many groups of a given number make a total will introduce them to the idea of division. Children will also be taught to double and halve numbers, and will thus experience scaling up or down as a further aspect of multiplication and division.

**Fractions:** Fractions will be introduced as numbers and as operators, specifically in relation to halves, quarters and thirds.

	Mental calculation	Essential Knowledge for ALL children
Y1 +	<p>Number bonds ('story' of 5, 6, 7, 8, 9 and 10)</p> <p>Count on in 1s from a given 2-digit number</p> <p>Add two 1-digit numbers</p> <p>Add three 1-digit numbers, spotting doubles or pairs to 10</p> <p>Count on in 10s from any given 2-digit number e.g. 13, 23, 33..</p> <p>Add 10 to any given 2-digit number e.g. <math>27 + 10 =</math></p> <p>Use number facts to add 1-digit numbers to 2-digit numbers e.g. <i>Use <math>4 + 3</math> to work out <math>24 + 3</math>, <math>34 + 3</math></i></p> <p>Add by putting the larger number first</p>	<p>Know the + and = symbol</p> <p>Know number bonds to 10</p> <p>Count in 1s</p> <p>Count in 10s</p> <p>Count on 1 from any given 2-digit number</p> <p>Add two 1-digit numbers</p>
Y1 -	<p>Number bonds ('story' of 5, 6, 7, 8, 9 and 10)</p> <p>Count back in 1s from a given 2-digit number e.g. 4, 45, 44, 43...</p> <p>Subtract one 1-digit number from another</p> <p>Count back in 10s from any given 2-digit number e.g. 55, 45, 35..</p> <p>Subtract 10 from any given 2-digit number</p> <p>Use number facts to subtract 1-digit numbers from 2-digit numbers e.g. <i>Use <math>7 - 2</math> to work out <math>27 - 2</math>, <math>37 - 2</math></i></p>	<p>Know the - and = symbols</p> <p>Know subtraction facts to 10</p> <p>Count back in 1s from 20 to 0</p> <p>Count back in 10s from 100 to 0</p> <p>Count back 1 from any given 2-digit number</p>
Y1 ×	<p>Begin to count in 2s, 5s and 10s</p> <p>Begin to say what three 5s are by counting in 5s, or what four 2s are by counting in 2s, etc.</p> <p>Double numbers to 10</p>  <p><math>7 + 7 = 14</math></p>	<p>Know doubles up to 10.</p> <p>Begin to count in 2s, 5s and 10s</p> <p>Double numbers to 10 using fingers</p>

	Mental calculation	Essential Knowledge for ALL children
<p>Y1 ÷</p>	<p>Begin to count in 2s, 5s and 10s</p> <p>Find half of even numbers to 12 and know it is hard to halve odd numbers</p> <p>Find half of even numbers by sharing</p> <p>Through practical activities experience division as 'sharing' and 'grouping'</p> <p>Sharing – 6 sweets are shared between 2 people. How many do they have each?</p>  <p>Practical activities involving sharing, distributing cards when playing a game, putting objects onto plates, into cups, hoops etc.</p> <p><b>Grouping</b></p> <p>Sorting objects into 2s / 5s/ 10s etc.</p> <p>How many pairs of socks are there?</p>  <p>There are 10 bulbs. Plant 5 in each pot. How many pots are there?</p> <p>Jo has 10 Lego wheels. How many bicycles can she make?</p>	<p>Know halves of even numbers to 20.</p> <p>Begin to count in 2s, 5s and 10s</p> <p>Find half of even numbers by sharing</p>

Year 2

Mental calculation

Essential Knowledge for ALL children

Number bonds – know all the pairs of numbers which make all the numbers to 12 e.g.  
 $5 + 3 = 8$ ,  $6 + 2 = 8$

e.g.  $9 + 2 = 11$ ,  $10 + 1 = 11$

-know all the of numbers pairs with a total of 20

e.g.  $10 + 10$ ,  $9 + 11$ ,  $8 + 12$ ..

Count on in 1s and 10s from any given 2-digit number

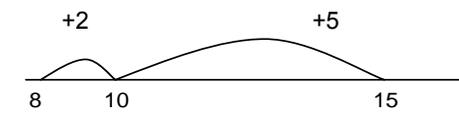
Add two or three 1-digit numbers

Add a 1-digit number to any 1 or 2-digit number using number facts, including bridging multiples of 10

e.g.  $8 + 7$

e.g.  $45 + 6$

$8 + 7 = 15$



Add 10 and small multiples of 10 to any given 2-digit number

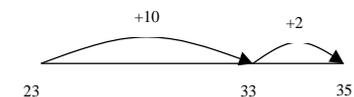
Add any pair of 2-digit numbers.

$23 + 12 = 23 + 10 + 2$

$= 33 + 2$

$= 35$

Use a number line to support mental calculations starting at 23 and jumping 10 (J10) to make 33 and then add 2 in one jump.



Know addition facts to 20 and solve related addition facts to 100

Know pairs of numbers which make each total up to 10

Add a 1-digit number to a 2-digit number by counting on in 1s

Add 10 and small multiples of 10 to a 2-digit number by counting on in 10s

Add three 1-digit numbers

Use addition facts to add a 1-digit number to a 2-digit number

Y2  
+

Y2

-

Number bonds – know all the pairs of numbers which make all the numbers to 12

Count back in 1s and 10s from any given 2-digit number

Subtract a 1-digit number from any 2-digit number using number facts, including bridging multiples of 10

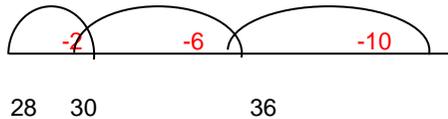
e.g.  $56 - 3$

e.g.  $53 - 5$

Subtract 10 and small multiples of 10 from any given 2-digit number

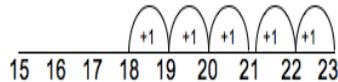
Subtract any pair of 2-digit numbers by counting back in 10s and 1s

e.g.  $46 - 18$



Subtract any pair any pair of 2-digit numbers by counting on (when the numbers are close)

e.g.  $23 - 18 = 5$



Know subtraction facts to 20.

Subtract a 1-digit number from a 2-digit number by counting back in 1s

Subtract 10 and small multiples of 10 from a 2-digit number by counting back in 10s

Subtract a 1-digit number from a 2-digit number using known facts

Y2

x

Count in 2s, 5s and 10s

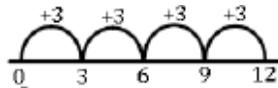
Begin to count in 3s

Begin to understand that multiplication is repeated addition and to use arrays



Begin to represent multiplication as repeated addition on a number line

e.g.  $3 + 3 + 3 + 3$  or  $3 \times 4$



Begin to learn the  $\times 2$ ,  $\times 3$ ,  $\times 5$  and  $\times 10$  tables, seeing these as 'lots of'

e.g. *5 lots of 2, 6 lots of 2, 7 lots of 2*

Double numbers up to 20

e.g.  $17 + 17$



Begin to double multiples of 5 to 100

Begin to double 2-digit numbers less than 50 with 1s digits of 1, 2, 3, 4 or 5

Count in 2s, 5s and 10s

Begin to use and understand simple arrays

e.g.  $2 \times 4$  is four lots of 2

Double numbers up to 20

Double multiples of 10 to 50

Know the 2x, 5x and 10x tables

Know x and = symbols

Count in 2s, 5s and 10s

Begin to count in 3s

Using fingers, say where a given number is in the 2s, 5s or 10s count

e.g. 8 is the fourth number when I count in 2

Relate division to grouping

12 children get into teams of 4 to play a game. How many teams are there?



**Understand division as sharing and grouping**

e.g.  $24 \div 3$  can be modelled as:

Sharing – 24 shared between 3

OR

Grouping - How many 3's make 24?

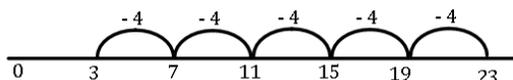
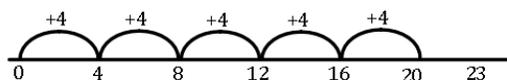
**Remainders**

$23 \div 4 = 5r3$

Sharing - 23 shared between 4, how many left over?

Grouping – How many 4's make 23, how many left over?

e.g.



Halve numbers to 20

Begin to halve numbers to 40 and multiples of 10 to 100

Find  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$  and  $\frac{3}{4}$  of a quantity of objects and of amounts (whole number answers)

Count in 2s, 5s and 10s

Say how many rows in a given array

e.g. *How many rows of 5 are in an array of  $3 \times 5$ ?*

Halve even numbers to 20

Find  $\frac{1}{2}$  and  $\frac{1}{4}$  of amounts

Know the  $\div$  and  $=$  symbols

Y2  
 $\div$

## LOWER KEY STAGE 2

In Lower Key Stage 2, children build on the concrete and conceptual understandings they have gained in Key Stage 1 to develop a real mathematical understanding of the four operations, in particular developing arithmetical competence in relation to larger numbers.

**Addition and subtraction:** Children are taught to use place value and number facts to add and subtract numbers mentally and they will develop a range of strategies to enable them to discard the 'counting in 1s' or fingers-based methods of Key Stage 1. In particular, children will learn to add and subtract multiples and near multiples of 10, 100 and 1000, and will become fluent in complementary addition as an accurate means of achieving fast and accurate answers to 3-digit subtractions. Standard written methods for adding larger numbers are taught, learned and consolidated, and written column subtraction is also introduced.

**Multiplication and division:** This key stage is also the period during which all the multiplication and division facts are thoroughly memorised, including all facts up to  $12 \times 12$ . Efficient written methods for multiplying or dividing a 2-digit or 3-digit number by a 1-digit number are taught, as are mental strategies for multiplication or division with large but 'friendly' numbers, e.g. when dividing by 5 or multiplying by 20.

**Fractions and decimals:** Children will develop their understanding of fractions, learning to reduce a fraction to its simplest form, as well as finding non-unit fractions of amounts and quantities. The concept of a decimal number is introduced and children consolidate a firm understanding of 1-place decimals, multiplying and dividing whole numbers by 10 and 100.

## Year 3

	Mental calculation	Written calculation	Essential Knowledge for ALL children
<b>Y3</b> <b>+</b>	<p>Know pairs with each total to 20 e.g. <math>2 + 6 = 8</math>, <math>12 + 6 = 18</math>, <math>7 + 8 = 15</math></p> <p>Know pairs of multiples of 10 with a total of 100</p> <p>Add any two 2-digit numbers by counting on in 10s and 1s or by using partitioning</p> <p>Add multiples and near multiples of 10 and 100</p> <p>Perform place-value additions without a struggle e.g. <math>300 + 8 + 50 = 358</math></p> <p>Use place value and number facts to add a 1-digit or 2-digit number to a 3-digit number e.g. <math>104 + 56</math> is 160 since <math>104 + 50 = 154</math> and <math>6 + 4 = 10</math> <math>676 + 8</math> is 684 since <math>8 = 4 + 4</math> and <math>76 + 4 + 4 = 84</math></p> <p>Add pairs of 'friendly' 3-digit numbers e.g. <math>320 + 450</math></p> <p>Begin to add amounts of money using partitioning</p>	<p>Use expanded column addition to add two or three 3-digit numbers or three 2-digit numbers.</p> <p>Starting with the most significant digit using brackets. <math>367 + 185 = 552</math></p> $\begin{array}{r} 367 \\ +185 \\ \hline 400 \text{ (300+100)} \\ 140 \text{ (60+80)} \\ \underline{12} \text{ (7+5)} \\ 552 \end{array}$	<p>Know pairs of numbers which make each total to 20</p> <p>Know pairs of multiples of 10 with a total of 100</p> <p>Add two 2-digit numbers by counting on in 10s and 1s e.g. <math>56 + 35</math> is <math>56 + 30</math> and then add the 5</p> <p>Understand simple place-value additions e.g. <math>200 + 40 + 5 = 245</math></p> <p>Use place value to add multiples of 10 or 100</p>

		<p>Moving on to expanded column addition without brackets.</p> $367 + 185 = 552$ $\begin{array}{r} 367 \\ +185 \\ \hline 400 \\ 140 \\ \underline{12} \\ 552 \end{array}$ <p>Begin to add like fractions e.g. <math>\frac{3}{8} + \frac{1}{8} + \frac{1}{8}</math></p> <p>Recognise like fractions that add to 1 e.g. <math>\frac{1}{4} + \frac{3}{4}</math> e.g. <math>\frac{3}{5} + \frac{2}{5}</math></p>	
<p><b>Y3</b> —</p>	<p>Know pairs with each total to 20 e.g. <math>8 - 2 = 6</math> e.g. <math>18 - 6 = 12</math> e.g. <math>15 - 8 = 7</math></p> <p>Subtract any two 2-digit numbers</p> <p>Perform place-value subtractions without a struggle e.g. <math>536 - 30 = 506</math></p> <p>Subtract 2-digit numbers from numbers &gt; 100 by counting up e.g. <i>143 - 76 is done by starting at 76. Then add 4 (80), then add 20 (100), then add 43, making the difference a total of 67</i></p> <p>Subtract multiples and near multiples of 10 and 100</p> <p>Subtract, when appropriate, by counting back or taking away, using place value and number facts</p> <p>Find change from £1, £5 and £10</p>	<p>Use counting up as an informal written strategy for subtracting pairs of 3-digit numbers <math>754 - 568 = 186</math></p> $\begin{array}{r} 754 \\ -568 \\ \hline 32 \text{ (600)} \\ 100 \text{ (700)} \\ \underline{54} \text{ (754)} \\ 186 \end{array}$ <p>Use expanded column subtraction with 'friendly' numbers</p> $\begin{array}{r} 345 - 123 \\ 300 + 40 + 5 \\ - (100 + 20 + 3) \\ \hline 200 + 20 + 2 \end{array}$ <p>Begin to subtract like fractions e.g. <math>\frac{7}{8} - \frac{3}{8}</math></p>	<p>Know pairs of numbers which make each total up to 20. Count up to subtract 2-digit numbers e.g. <math>72 - 47</math></p> <p>Subtract multiples of 5 from 100 by counting up e.g. <math>100 - 35</math></p> <p>Subtract multiples of 10 and 100</p>

Y3  
×

Know by heart all the multiplication facts in the  $\times 2$ ,  $\times 3$ ,  $\times 4$ ,  $\times 5$ ,  $\times 8$  and  $\times 10$  tables  
Multiply whole numbers by 10 and 100  
Recognise that multiplication is commutative  
Use place value and number facts in mental multiplication  
e.g.  $30 \times 5$  is  $15 \times 10$   
Partition teen numbers to multiply by a 1-digit number  
e.g.  $3 \times 14$  as  $3 \times 10$  and  $3 \times 4$   
Double numbers up to 50

Use partitioning (grid multiplication) to multiply 2-digit and 3-digit numbers by 'friendly' 1-digit numbers

$$23 \times 3 =$$

X	20	3
3	$3 \times 20 =$	$3 \times 3 =$
	<u>60</u>	<u>9</u>

Know by heart the  $\times 2$ ,  $\times 3$ ,  $\times 4$ ,  $\times 5$  and  $\times 10$  tables  
Double given tables facts to get others  
Double numbers up to 25 and multiples of 5 to 50

Y3  
÷

Know by heart all the division facts derived from the  $\times 2$ ,  $\times 3$ ,  $\times 4$ ,  $\times 5$ ,  $\times 8$  and  $\times 10$  tables  
Divide whole numbers by 10 or 100 to give whole number answers  
Recognise that division is not commutative  
Use place value and number facts in mental division  
e.g.  $84 \div 4$  is half of 42  
Divide larger numbers mentally by subtracting the 10th multiple as appropriate, including those with remainders  
e.g.  $57 \div 3$  is  $10 + 9$  as  $10 \times 3 = 30$  and  $9 \times 3 = 27$   
Halve even numbers to 100, halve odd numbers to 20  
Find tenths of a multiple of ten by dividing by 10.

Perform divisions just above the 10th multiple using horizontal jottings and understanding how to give a remainder as a whole number  
e.g.  $60 \div 12$  grouping – 12 subtracted repeatedly from 60 on a no. line, leading to subtracting 'groups' of 12.  
sharing – sharing among 12, the number given to each person.

Find unit fractions of quantities and begin to find non-unit fractions of quantities

Know by heart the division facts derived from the  $\times 2$ ,  $\times 3$ ,  $\times 4$ ,  $\times 5$  and  $\times 10$  tables  
Halve even numbers up to 50 and multiples of 10 to 100  
Perform divisions within the tables including those with remainders  
e.g.  $38 \div 5$

Year 4

	Mental calculation	Written calculation	Essential Knowledge for ALL children
<b>Y4</b> +	<p>Add any two 2-digit numbers by partitioning or counting on</p> <p>Know by heart/quickly derive number bonds to 100 and to £1</p> <p>Add to the next 100, £1 and whole number</p> <p>e.g. <math>234 + 66 = 300</math></p> <p>e.g. <math>3 \cdot 4 + 0 \cdot 6 = 4</math></p> <p>Perform place-value additions without a struggle</p> <p>e.g. <math>300 + 8 + 50 + 4000 = 4358</math></p> <p>Add multiples and near multiples of 10, 100 and 1000</p> <p>Add £1, 10p, 1p to amounts of money</p> <p>Use place value and number facts to add 1-, 2-, 3- and 4-digit numbers where a mental calculation is appropriate</p> <p>e.g. <math>4004 + 156</math> by knowing that <math>6 + 4 = 10</math> and that <math>4004 + 150 = 4154</math> so the total is 4160</p>	<p>Column addition for 3-digit and 4-digit numbers</p> <p><b><u>Adding the least significant digits first</u></b></p> $\begin{array}{r} 247 \\ + 176 \\ \hline 13 \quad (7+6) \\ 110 \quad (40 + 70) \\ \underline{300} \quad (200 + 100) \\ 423 \end{array}$ <p><b>Moving on to</b></p> $\begin{array}{r} 247 \\ + 376 \\ \hline 13 \\ 110 \\ \underline{500} \\ 623 \end{array} \quad \text{(without use of brackets)}$ <p><b>Moving on to a compact method</b></p> $\begin{array}{r} 247 \\ + 376 \\ \hline 623 \\ 11 \end{array}$ <p>Add like fractions</p> <p>e.g. <math>\frac{3}{5} + \frac{4}{5} = \frac{7}{5} = \frac{7}{5}</math></p> <p>Be confident with fractions that add to 1 and fraction complements to 1</p> <p>e.g. <math>\frac{2}{3} + \_ = 1</math></p>	<p>Add any 2-digit numbers by partitioning or counting on</p> <p>Add 'friendly' larger numbers using knowledge of place value and number facts</p> <p>Use column addition to add pairs of 3- and 4-digit numbers</p>

Y4

—

Subtract any two 2-digit numbers  
Know by heart/quickly derive number bonds to 100  
Perform place-value subtractions without a struggle  
e.g.  $4736 - 706 = 4030$

Subtract multiples and near multiples of 10, 100, 1000, £1 and 10p

Subtract multiples of 0.1

Subtract by counting up

e.g.  $503 - 368$  is done by adding

$368 + 2 + 30 + 100 + 3$  (so we added 135)

Subtract, when appropriate, by counting back or taking away, using place value and number facts

Subtract £1, 10p, 1p from amounts of money

Find change from £10, £20 and £50

Use column subtraction for 3- and 4-digit numbers, which includes decomposition

$$\begin{array}{r} 252 - 114 \\ \hline 200 + 50 + 2 \\ - (100 + 10 + 4) \\ \hline ? \end{array}$$

$$\begin{array}{r} 200 + 40 + 12 \\ - (100 + 10 + 4) \\ \hline 100 + 30 + 8 \end{array}$$

Use complementary addition to subtract amounts of money, and for subtractions where the larger number is a near multiple of 1000 or 100

e.g.  $2002 - 1895$

$$2002 - 1895 = 107$$

$$\begin{array}{r} 5 \text{ (1900)} \\ 100 \text{ (2000)} \\ \underline{2 \text{ (2002)}} \\ 107 \end{array}$$

Subtract like fractions

e.g.  $\frac{4}{5} - \frac{3}{5} = \frac{1}{5}$

Use fractions that add to 1 to find fraction complements to 1

e.g.  $1 - \frac{2}{3} = \frac{1}{3}$

Use counting up with confidence to solve most subtractions, including finding complements to multiples of 100

e.g.  $512 - 287$

e.g.  $67 + \_ = 100$

Y4  
x

Know by heart all the multiplication facts up to  $12 \times 12$   
Recognise factors up to 12 of 2-digit numbers  
Multiply whole numbers and 1-place decimals by 10, 100, 1000

Multiply multiples of 10, 100 and 1000 by 1-digit numbers

e.g.  $300 \times 6$

e.g.  $4000 \times 8$

Use understanding of place value and number facts in mental multiplication

e.g.  $36 \times 5$  is half of  $36 \times 10$

e.g.  $50 \times 60 = 3000$

Partition 2-digit numbers to multiply by a 1-digit number mentally

e.g.  $4 \times 24$  as  $4 \times 20$  and  $4 \times 4$

Multiply near multiples by rounding

e.g.  $33 \times 19$  as  $(33 \times 20) - 33$

Find doubles to double 100 and beyond using partitioning

Begin to double amounts of money

e.g.  $£35.60$  doubled is  $£71.20$

Use a vertical written method to multiply a 1-digit number by a 3-digit number (ladder method and short multiplication)

$$\begin{array}{r} 202 \\ \times 4 \\ \hline 808 \end{array}$$

Use an efficient written method to multiply a 2-digit number by a number between 10 and 20 by partitioning (grid method)

x	10	6
10	$10 \times 10 =$ <u>100</u>	$10 \times 6 =$ <u>60</u>
7	$7 \times 10 =$ <u>70</u>	$7 \times 6 =$ <u>42</u>

$$100 + 60 + 70 + 42 = 272$$

Know by heart multiplication tables up to  $12 \times 12$

Multiply whole numbers by 10 and 100

Use the grid method to multiply a 2-digit or a 3-digit number by a number  $\leq 6$

**Y4**  
**÷**

Know by heart all the division facts up to  $144 \div 12$

Divide whole numbers by 10, 100, to give whole number answers or answers with 1 decimal place

Divide multiples of 100 by 1-digit numbers using division facts

e.g.  $3200 \div 8 = 400$

Use place value and number facts in mental division

e.g.  $245 \div 20$  is half of  $245 \div 10$

Divide larger numbers mentally by subtracting the 10th or 20th multiple as appropriate

e.g.  $156 \div 6$  is  $20 + 6$  as  $20 \times 6 = 120$  and  $6 \times 6 = 36$

Find halves of even numbers to 200 and beyond using partitioning

Begin to halve amounts of money

e.g. half of  $\pounds 52.40$  is  $\pounds 26.20$

Use a written method to divide a 2-digit or a 3-digit number by a 1-digit number (short division)

$432 \div 5$  becomes

$$\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \end{array}$$

**Answer: 86 remainder 2**

Give remainders as whole numbers

Begin to reduce fractions to their simplest forms

Find unit and non-unit fractions of larger amounts

Know by heart all the division facts up to  $144 \div 12$

Divide whole numbers by 10 and 100 to give whole number answers or answers with

1 decimal place

Find unit fractions of amounts

## UPPER KEY STAGE 2

Children move on from dealing mainly with whole numbers to performing arithmetic operations with both decimals and fractions.

**Addition and subtraction:** Children will consolidate their use of written procedures in adding and subtracting whole numbers with up to 6 digits and also decimal numbers with up to 2 decimal places. Mental strategies for adding and subtracting increasingly large numbers will also be taught. These will draw upon children's robust understanding of place value and knowledge of number facts. Negative numbers will be added and subtracted.

**Multiplication and division:** Efficient and flexible strategies for mental multiplication and division are taught and practised, so that children can perform appropriate calculations even when the numbers are large, such as  $40\,000 \times 6$  or  $40\,000 \div 8$ . In addition, it is in Years 5 and 6 that children extend their knowledge and confidence in using written algorithms for multiplication and division.

**Fractions, decimals, percentages and ratio:** Fractions and decimals are also added, subtracted, divided and multiplied, within the bounds of children's understanding of these more complicated numbers. Children will also calculate simple percentages and ratios.

### Year 5

	Mental calculation	Written calculation	Essential Knowledge for ALL children
<b>Y5</b> <b>+</b>	<p>Know number bonds to 1 and to the next whole number</p> <p>Add to the next 10 from a decimal number e.g. <math>13.6 + 6.4 = 20</math></p> <p>Add numbers with 2 significant digits only, using mental strategies e.g. <math>3.4 + 4.8</math> e.g. <math>23\,000 + 47\,000</math></p> <p>Add 1- or 2-digit multiples of 10, 100, 1000, 10 000 and 100 000 e.g. <math>8000 + 7000</math> e.g. <math>600\,000 + 700\,000</math></p> <p>Add near multiples of 10, 100, 1000, 10 000 and 100 000 to other numbers e.g. <math>82\,472 + 30\,004</math></p> <p>Add decimal numbers which are near multiples of 1 or 10, including money e.g. <math>6.34 + 1.99</math> e.g. <math>\pounds 34.59 + \pounds 19.95</math></p> <p>Use place value and number facts to add two or more 'friendly' numbers, including money and decimals e.g. <math>3 + 8 + 6 + 4 + 7</math> e.g. <math>0.6 + 0.7 + 0.4</math> e.g. <math>2056 + 44</math></p>	<p>Use compact column addition to add two or three whole numbers with up to 5 digits</p> <p><math>3587 + 675 = 4262</math></p> $\begin{array}{r} 3587 \\ + 675 \\ \hline 4262 \\ 111 \end{array}$ <p>Use column addition to add any pair of 2-place decimal numbers, including amounts of money</p> <p><math>13.86 + 9.48 = 23.341</math></p> $\begin{array}{r} 13.86 \\ + 9.48 \\ \hline 23.34 \\ 111 \end{array}$ <p>Begin to add related fractions using equivalences e.g. <math>\frac{1}{2} + \frac{1}{6} = \frac{3}{6} + \frac{1}{6}</math></p> <p>Choose the most efficient method in any given situation</p>	<p>Add numbers with only 2 digits which are not zeros e.g. <math>3.4 + 5.8</math></p> <p>Derive swiftly and without any difficulty number bonds to 100</p> <p>Add large numbers using knowledge of place value and number facts</p> <p>Use column addition to add groups of 4- and 5-digit numbers</p>

**Y5**  
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Subtract numbers with 2 significant digits only, using mental strategies

e.g.  $6.2 - 4.5$

e.g.  $72\,000 - 47\,000$

Subtract 1- or 2-digit multiples of 10, 100, 1000, 10 000 and 100 000

e.g.  $8000 - 3000$

e.g.  $60\,000 - 200\,000$

Subtract 1- or 2-digit near multiples of 10, 100, 1000, 10 000 and 100 000 from other numbers

e.g.  $82\,472 - 30\,004$

Subtract decimal numbers which are near multiples of 1 or 10, including money

e.g.  $6.34 - 1.99$

e.g.  $£34.59 - £19.95$

Use counting up subtraction, with knowledge of number bonds to 10, 100 or £1, as a strategy to perform mental subtraction

e.g.  $£10 - £3.45$

e.g.  $1000 - 782$

Recognise fraction complements to 1 and to the next whole number

e.g.  $1\frac{2}{5} + \frac{3}{5} = 2$

Use column subtraction to subtract numbers with up to 5 digits

$$\begin{array}{r} 346 \\ - 128 \\ \hline \end{array}$$

$$\begin{array}{r} 346 \\ - 128 \\ \hline 218 \end{array}$$

$$\begin{array}{r} 346 \\ - 128 \\ \hline 218 \end{array}$$

$$218$$

Use complementary addition for subtractions where the larger number is a multiple or near multiple of 1000

Use complementary addition for subtractions of decimal numbers with up to 2 places, including amounts of money

$$6467 - 2684 = 3783$$

$$16\ (2700)$$

$$300\ (3000)$$

$$\underline{3467}\ (6467)$$

$$\underline{3783}$$

Begin to subtract related fractions using equivalences

e.g.  $\frac{1}{2} - \frac{1}{6} = \frac{2}{6}$

Choose the most efficient method in any given situation

Derive swiftly and without difficulty number bonds to 100

Use counting up with confidence to solve most subtractions, including finding complements to multiples of 1000

e.g.  $3000 - 2387$

**Y5**  
**x**

Know by heart all the multiplication facts up to  $12 \times 12$

Multiply whole numbers and 1- and 2-place decimals by 10, 100, 1000, 10 000

Use knowledge of factors and multiples in multiplication  
e.g.  $43 \times 6$  is double  $43 \times 3$   
e.g.  $28 \times 50$  is  $\frac{1}{2}$  of  $28 \times 100 = 1400$

Use knowledge of place value and rounding in mental multiplication  
e.g.  $67 \times 199$  as  $67 \times 200 - 67$

Use doubling and halving as a strategy in mental multiplication  
e.g.  $58 \times 5$  is half of  $58 \times 10$   
e.g.  $34 \times 4$  is  $34$  doubled twice

Partition 2-digit numbers, including decimals, to multiply by a 1-digit number mentally  
e.g.  $6 \times 27$  as  $6 \times 20$  (120) plus  $6 \times 7$  (42)  
e.g.  $6.3 \times 7$  as  $6 \times 7$  (42) plus  $0.3 \times 7$  (2.1)

Double amounts of money by partitioning  
e.g.  $\pounds 37.45$  doubled is  $\pounds 37$  doubled ( $\pounds 74$ ) plus 45p doubled (90p) giving a total of  $\pounds 74.90$

Use short multiplication to multiply a 1-digit number by a number with up to 4 digits

$$\begin{array}{r} 225 \\ \times \quad 5 \\ \hline 1325 \end{array}$$

Use long multiplication to multiply 3-digit and 4-digit numbers by a number between 11 and 20

Choose the most efficient method in any given situation

Find simple percentages of amounts

e.g. 10%, 5%, 20%, 15% and 50%

Begin to multiply fractions and mixed numbers by whole numbers  $\leq 10$

e.g.  $4 \times \frac{2}{3} = \frac{8}{3} = 2 \frac{2}{3}$

Know multiplication tables to  $12 \times 12$

Multiply whole numbers and 1-place decimals by 10, 100 and 1000

Use knowledge of factors as aids to mental multiplication

e.g.  $13 \times 6$  is double  $13 \times 3$

e.g.  $23 \times 5$  is  $\frac{1}{2}$  of  $23 \times 10$

Use the grid method to multiply numbers with up to 4 digits by 1-digit numbers

Use the grid method to multiply 2-digit numbers by 2-digit numbers

**Y5**  
÷

Know by heart all the division facts up to  $144 \div 12$   
Divide whole numbers by 10, 100, 1000, 10 000 to give whole number answers or answers with 1, 2 or 3 decimal places  
Use doubling and halving as mental division strategies  
e.g.  $34 \div 5$  is  $(34 \div 10) \times 2$   
Use knowledge of multiples and factors, as well as tests for divisibility, in mental division  
e.g.  $246 \div 6$  is  $123 \div 3$   
e.g. *We know that 525 divides by 25 and by 3*  
Halve amounts of money by partitioning  
e.g.  $\frac{1}{2}$  of  $\pounds 75.40 = \frac{1}{2}$  of  $\pounds 75$  ( $\pounds 37.50$ ) plus half of 40p (20p) which is  $\pounds 37.70$   
Divide larger numbers mentally by subtracting the 10th or 100th multiple as appropriate  
e.g.  $96 \div 6$  is  $10 + 6$ , as  $10 \times 6 = 60$  and  $6 \times 6 = 36$   
e.g.  $312 \div 3$  is  $100 + 4$  as  $100 \times 3 = 300$  and  $4 \times 3 = 12$   
Know tests for divisibility by 2, 3, 4, 5, 6, 9 and 25  
Know square numbers and cube numbers  
Reduce fractions to their simplest form

Use short division to divide a number with up to 4 digits by a number  $\leq 12$

$496 \div 11$  becomes

$$\begin{array}{r} 45 \text{ r } 1 \\ 11 \overline{) 496} \\ \underline{44} \phantom{6} \\ 56 \\ \underline{55} \\ 1 \end{array}$$

Give remainders as whole numbers or as fractions  
Find non-unit fractions of large amounts  
Turn improper fractions into mixed numbers and vice versa  
Choose the most efficient method in any given situation

Know by heart division facts up to  $144 \div 12$   
Divide whole numbers by 10, 100 or 1000 to give answers with up to 1 decimal place  
Use doubling and halving as mental division strategies  
Use an efficient written method to divide numbers  $\leq 1000$  by 1-digit numbers  
Find unit fractions of 2- and 3-digit numbers

Year 6

	Mental calculation	Written calculation	Essential Knowledge for ALL children
<b>Y6</b> +	<p>Know by heart number bonds to 100 and use these to derive related facts e.g. <math>3 \cdot 46 + 0 \cdot 54</math></p> <p>Derive, quickly and without difficulty, number bonds to 1000</p> <p>Add small and large whole numbers where the use of place value or number facts makes the calculation do-able mentally e.g. <math>34\ 000 + 8000</math></p> <p>Add multiples of powers of 10 and near multiples of the same e.g. <math>6345 + 199</math></p> <p>Add negative numbers in a context such as temperature where the numbers make sense</p> <p>Add two 1-place decimal numbers or two 2-place decimal numbers less than 1 e.g. <math>4 \cdot 5 + 6 \cdot 3</math> e.g. <math>0 \cdot 74 + 0 \cdot 33</math></p> <p>Add positive numbers to negative numbers e.g. <i>Calculate a rise in temperature or continue a sequence beginning with a negative number</i></p>	<p>Use column addition to add numbers with up to 5 digits <math>12350 + 4921</math></p> $\begin{array}{r} 12350 \\ + 4921 \\ \hline 17271 \end{array}$ <p>Use column addition to add decimal numbers with up to 3 decimal places <math>13.86 + 9.481 = 23.341</math></p> $\begin{array}{r} 13.86 \\ + 9.481 \\ \hline 23.341 \\ \small{1\ 1\ 1} \end{array}$ <p>Add mixed numbers and fractions with different denominators</p>	<p>Know number bonds to 1 and to the next whole number, using numbers with 2 decimal places</p> <p>Use place value and number facts to add 'friendly' large or decimal numbers e.g. <math>3 \cdot 4 + 6 \cdot 6</math> e.g. <math>26\ 000 + 54\ 000</math></p> <p>Use column addition to add pairs of 2-place decimal numbers</p>

Y6

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Use number bonds to 100 to perform mental subtraction of any pair of integers by complementary addition

e.g.  $1000 - 654$  as  $46 + 300$  in our heads

Use number bonds to 1 and 10 to perform mental subtraction of any pair of 1-place or 2-place decimal numbers using complementary addition and including money

e.g.  $10 - 3.65$  as  $0.35 + 6$

e.g.  $£50 - £34.29$  as  $71p + £15$

Use number facts and place value to perform mental subtraction of large numbers or decimal numbers with up to 2 places

e.g.  $467\ 900 - 3005$

e.g.  $4.63 - 1.02$

Subtract multiples of powers of 10 and near multiples of the same

Subtract negative numbers in a context such as temperature where the numbers make sense

Use column subtraction to subtract numbers with up to 6 digits

$23451 - 5274$

23451

  5274

18177

Use complementary addition for subtractions where the larger number is a multiple or near multiple of 1000 or 10 000

Use complementary addition for subtractions of decimal numbers with up to 3 places, including money

Subtract mixed numbers and fractions with different denominators

Use number bonds to 100 to perform mental subtraction of numbers up to 1000 by complementary addition

e.g.  $1000 - 654$  as  $46 + 300$  in our heads

Use complementary addition for subtraction of integers up to 10 000

e.g.  $2504 - 1878$

Use complementary addition for subtractions of 1-place decimal numbers and amounts of money

e.g.  $£7.30 - £3.55$

**Y6**  
**x**

Know by heart all the multiplication facts up to  $12 \times 12$   
 Multiply whole numbers and decimals with up to 3 places by 10, 100 or 1000  
 e.g.  $234 \times 1000 = 234\ 000$   
 e.g.  $0.23 \times 1000 = 230$   
 Identify common factors, common multiples and prime numbers and use factors in mental multiplication  
 e.g.  $326 \times 6$  is  $652 \times 3$  which is 1956  
 Use place value and number facts in mental multiplication  
 e.g.  $4000 \times 6 = 24\ 000$   
 e.g.  $0.03 \times 6 = 0.18$   
 Use doubling and halving as mental multiplication strategies, including to multiply by 2, 4, 8, 5, 20, 50 and 25  
 e.g.  $28 \times 25$  is a quarter of  $28 \times 100 = 700$   
 Use rounding in mental multiplication  
 e.g.  $34 \times 19$  as  $(34 \times 20) - 34$   
 Multiply 1- and 2-place decimals by numbers up to and including 10 using place value and partitioning  
 e.g.  $3.6 \times 4$  is  $12 + 2.4$   
 e.g.  $2.53 \times 3$  is  $6 + 1.5 + 0.09$   
 Double decimal numbers with up to 2 places using partitioning  
 e.g.  $36.73$  doubled is double 36 (72) plus double 0.73 (1.46)

Use short multiplication to multiply a 1-digit number by a number with up to 4 digits  
 Use long multiplication to multiply a 2-digit number by a number with up to 4 digits  
 $382 \times 23 =$

$\begin{array}{r} 300 + 80 + 2 \\ \times \quad 20 + 3 \\ \hline 6 \quad (3 \times 2) \\ 240 \quad (3 \times 80) \\ 900 \quad (3 \times 300) \\ 40 \quad (20 \times 2) \\ 1600 \quad (20 \times 80) \\ \hline 6000 \quad (20 \times 300) \\ 8786 \end{array}$	$\begin{array}{r} 300 + 80 + 2 \\ \times \quad 20 + 3 \\ \hline 6 \\ 240 \\ 900 \\ 40 \\ 1600 \\ \hline 6000 \\ 8786 \end{array}$
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Use short multiplication to multiply a 1-digit number by a number with 1 or 2 decimal places, including amounts of money  
 Multiply fractions and mixed numbers by whole numbers  
 Multiply fractions by proper fractions  
 Use percentages for comparison and calculate simple percentages

Know by heart all the multiplication facts for multiples of ten up to  $120 \times 120$   
 Multiply whole numbers and 1- and 2-place decimals by 10, 100 and 1000  
 Use an efficient written method to multiply a 1-digit or a teen number by a number with up to 4 digits by partitioning (grid method)  
 Multiply a 1-place decimal number up to 10 by a number  $\leq 100$  using the grid method

Y6  
÷

Know by heart all the division facts up to  $144 \div 12$   
Divide whole numbers by powers of 10 to give whole number answers or answers with up to 3 decimal places  
Identify common factors, common multiples and primes numbers and use factors in mental division  
e.g.  $438 \div 6$  is  $219 \div 3$  which is 73  
Use tests for divisibility to aid mental calculation  
Use doubling and halving as mental division strategies, for example to divide by 2, 4, 8, 5, 20 and 25  
e.g.  $628 \div 8$  is halved three times:  
314, 157, 78.5  
Divide 1- and 2-place decimals by numbers up to and including 10 using place value  
e.g.  $2.4 \div 6 = 0.4$   
e.g.  $0.65 \div 5 = 0.13$   
e.g.  $\pounds 6.33 \div 3 = \pounds 2.11$   
Halve decimal numbers with up to 2 places using partitioning  
e.g. Half of 36.86 is half of 36 (18) plus half of 0.86 (0.43)  
Know and use equivalence between simple fractions, decimals and percentages, including in different contexts  
Recognise a given ratio and reduce a given ratio to its lowest terms

Use short division to divide a number with up to 4 digits by a 1-digit or a 2-digit number  
Use long division to divide 3-digit and 4-digit numbers by 2-digit numbers  
$$\begin{array}{r} 430 \\ 17 \overline{)7310} \\ \underline{68} \phantom{0} \\ 51 \phantom{0} \\ \underline{51} \phantom{0} \\ 0 \phantom{0} \end{array}$$
  
Give remainders as whole numbers or as fractions or as decimals  
Divide a 1-place or a 2-place decimal number by a number  $\leq 12$  using multiples of the divisors  
$$\begin{array}{r} 1.2 \\ 4 \overline{)4.8} \end{array}$$
  
Divide proper fractions by whole numbers

Know by heart all the division facts for multiples of ten up to  $14400 \div 120$   
Divide whole numbers by 10, 100, 1000 to give whole number answers or answers with up to 2 decimal places  
Use an efficient written method, involving subtracting powers of 10 times the divisor, to divide any number of up to 1000 by a number  $\leq 12$   
e.g.  $836 \div 11$  as  $836 - 770$  ( $70 \times 11$ ) leaving 66 which is  $6 \times 11$ , giving the answer 76  
Divide a 1-place decimal by a number  $\leq 10$  using place value and knowledge of division facts