

# How we teach calculations Calculation Policy for Mathematics

School:

Jigsaw Pupil Referral Unit

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#### AIMS AND OBJECTIVES

At Jigsaw, our main aims are as follows:

- to support pupils achieving their full potential in mathematics
- to develop pupils' confidence in their mathematical ability
- to support pupils maintaining their progress whilst their main school provision is assessed
- to provide a broad and varied mathematics curriculum, through a variety of teaching approaches and learning situations, to meet the needs of all pupils.

We seek to provide this for all, irrespective of gender, in accordance with our school policies on Equal Opportunities and Inclusion and in accordance with our statutory responsibilities under the SEN Disability Act 2001.

#### Inclusion

At Jigsaw we recognise our responsibility to provide a broad and balanced curriculum for all our pupils, as recognised in the Inclusion Statement in the National Curriculum. All aspects of the curriculum reflect the three principles essential to developing a more inclusive curriculum:

- setting suitable learning challenges;
- responding to pupils' diverse learning needs;
- overcoming potential barriers to learning and assessment

### Jigsaw's Calculation Policy

As children begin to understand the underlying ideas of calculation they will develop ways of recording to support their thinking and methods. Over time children will learn how to use models and images, such as empty number lines, to support their mental and informal written methods of calculation.

#### Our aim is that children leave Jigsaw equipped with mental, written and calculator methods which they understand and can use correctly and that when faced with a calculation, they are able to decide which method is most appropriate and have strategies to give an approximate answer and to check their solutions.

Whatever stage in their learning and whatever method is being used, it should still be underpinned by a secure and appropriate knowledge of number facts, along with those mental skills that are needed to carry out the process and judge if it was successful. Children need to develop a **fluency** and **efficiency** within mathematics.

This policy indicates the progression of written methods within each of the four operations. *Children will work at the age related expectation or in special cases at the appropriate stage of their understanding*. All methods will be used across a range of contexts e.g. money, measures etc and will be applied to decimals as appropriate. At Jigsaw we recognise that some of our pupils have gaps in their mathematical understanding due to the other difficulties they are facing, and in order to enable them to confidently access the curriculum in their mainstream school it may be appropriate to 'plug the gaps'. We use regular assessments and target setting to identify the areas of need with each child to focus on those missing skills.

#### It is essential that children are not moved on to new methods too quickly. It is also essential that children understand the previous methods and steps that are needed to support a written calculation.

The use of mathematical vocabulary is vital. This policy also outlines the key vocabulary to be used and introduced at each stage to ensure opportunities for children to develop quality mathematical dialogue.

Many pupils attend Jigsaw on a part time basis and the provision is short-stay in nature, meaning pupils are attending from a variety of schools in Sefton with a variety of policies; therefore this policy is intended as a *guide* as we will endeavour to be sensitive to the pupils' prior learning and methods taught.

### Reception to Year One – Addition

Reception: Add two single-digit numbers. Year one: Add 1-digit and 2-digit numbers to 20, including 0 Add three 1-digit numbers

#### Before performing an addition method using apparatus children should:

- Be able to touch count accurately.
- Recognise the numerals 0-10.
- Understand that each number has a value (related to an amount – Numicon or cubes is a good example).
- Recognise the addition and equal signs (+ and =)

#### Before performing addition on a numberline children should:

- Be able to touch count accurately.
- Have accessed a wide range of counting equipment, everyday objects, number tracks and number lines, and be shown numbers in different contexts.
- Understand that each number has a value (related to an amount – Numicon or cubes are a good example).
- Recognise the addition and equal signs (+ and =)
- Be able to complete the Reception calculation policy methods.

#### Addition using apparatus

Children should recognise the addition sign and understand the process as adding two sets together or combining two numbers together using apparatus. (Apparatus such as cubes, counting bear or counters)



#### Addition using fingers

Children can be taught to add using their fingers once they are secure using apparatus.

They can be taught to get the first number on their head and the next number on their hand. They should then count all their fingers (e.g. touching their nose) to establish the answer.



#### Before performing this method children should:

• Read and write the addition (+) and equals (=) signs within number sentences.

#### Addition using a numberline

Use numbered number lines to add, by counting on in ones. Encourage children to start with the **larger** number and count on.



Children should be encouraged to interpret addition number sentences and solve missing box problems with the box in different positions within the number sentence:

8 + 3 = 15 + 4 = 5 + 3 + 1 = 1

#### Key Vocabulary

Key vocabulary: add, more, plus, and, make, altogether, total, equal, double, most, count on, number bond

#### Key skills for addition at Reception:

- Read and write numbers to 20 in numerals.
- Recall number bonds to 5 and 10
- □ Count to and across tens (28, 29, 30 31 etc)
- Solve simple 1-step problems involving addition, using apparatus. Starting with objects and progressing to Numicon.

## Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line

#### Key skills for addition at year one:

- □ Read and write numbers to 100 in numerals, incl. 1—20 in words
- Recall bonds to 10 and 20, and addition facts within 20
- □ Count to and across 100
- □ Count in multiples of 1 2, 5 and 10
- Solve simple 1-step problems involving addition, using objects, number lines and pictorial representations.

Reception: Subtract a single-digit number from another single-digit number. Year one: Add and subtract 1-digit and 2-digit numbers to 20, including 0

#### Before performing an subtraction method children should:

- Be able to touch count accurately.
- Recognise the numerals 0-20.
- Understand that each number has a value (related to an amount – Numicon or cubes is a good example).
- Recognise the subtraction and equal signs (- and =)

#### Before performing subtraction on a numberline children should:

- Be able to touch count accurately.
- Have accessed a wide range of counting equipment, everyday objects, number tracks and number lines, and be shown numbers in different contexts.
- Understand that each number has a value (related to an amount – Numicon or cubes is a good example).
- Recognise the subtraction and equal signs (- and =)

Subtraction using apparatus Children should recognise the subtraction sign and understand the process as subtracting as taking away from a set of objects using apparatus. (Apparatus such as cubes, counting bear or counters)





Placing the objects in a line establishes a good method for touch counting. It allows for easy and clear touch counting.

The children should be taught to physically move the objects away from the group (taking away) and then count what is left.



#### Subtraction using finger

The children should then be taught to subtract using their fingers once they are secure using apparatus.

The children should be taught to get the first number on their head and the next number on their hand. They should then count back putting their fingers down to establish the answer.



They should then get the correct number of fingers to start. They should count to check.

#### Before performing this method children should:

• Read and write the addition (+) and equals (=) signs within number sentences.

#### Subtraction on a numberline

Use numbered number lines to subtract, by counting back in ones.



#### Key Vocabulary

<u>Key vocabulary:</u> equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is\_?

#### Key skills for subtraction at reception:

- Given a number, say one more or one less.
- Count forward and back
- □ Represent and use **subtraction facts for 5 and 10.**
- Read and write numbers from 0 to 20 in numerals.

<u>Key vocabulary:</u> equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is\_?

#### Key skills for subtraction at year one:

- Given a number, say **one more or one less.**
- Count to and over 100, **forward and back**, from any number.
- Represent and use **subtraction facts to 20 and within 20**.
- Subtract with **one-digit and two-digit** numbers to 20, including zero.
- Solve one-step problems that involve addition and subtraction, using concrete objects (ie bead string, objects, cubes) and pictures, and missing number problems.
- Read and write numbers from 0 to 20 in numerals and words.

### Year One – Multiplication

Recognise and write multiplication (x) With support solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays With support solve simple multiplication and division problems

Give children experience of counting equal group of objects in 2s, 5s and 10s.

Present practical problem solving activities involving counting equal sets or groups, as above.

How many legs have the teddies got?



2 + 2 + 2 = 6

The children should understand it as repeated addition and then move towards representing the calculation using a multiplication sign.

2 x 3= 6

There are 3 sweets in a bag. How many sweets are there is five bags?



3 x 5 = 15

#### Key Vocabulary

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count

#### Key skills for multiplication:

- Count in multiples of 2, 5 and 10.
- Solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.
- Make connections between arrays, number patterns, and counting in twos, fives and tens. Begin to understand doubling using concrete objects and pictorial representations.

### Year One – Division

Recognise and write and division symbols (÷) With support solve one-step problems involving division, by calculating the answer using concrete objects, pictorial representations and arrays With support solve simple division problems

#### Before performing this method children should:

- Use lots of practical apparatus, arrays and picture representations
- Be taught to understand the difference between "grouping" objects (How many groups of 2 can you make?) and "sharing" (Share these sweets between 2 people)
- Be able to count in multiples of 2s, 5s and 10s.
- Find half of a group of objects by sharing into 2 equal groups.

Children should be taught to use objects, diagrams and pictorial representations to solve problems involving **<u>both</u> grouping <u>and</u> sharing**.



#### Key vocabulary

Key Vocabulary: share, share equally, one each, two each..., group, groups of, lots of, array

#### Key number skills needed for division at year one:

- Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations arrays with the support of the teacher
- Through grouping and sharing small quantities, pupils begin to understand, division, and finding simple fractions of objects, numbers and quantities.
- They make connections between arrays, number patterns, and counting in twos, fives and tens.

### Year Two – Addition

Add and subtract up to two-digit numbers using written methods including columnar addition (without carrying or borrowing). Recognise that addition can be done in any order but subtraction cannot

Blank numberline Children should follow the set order below to developing their ability to add using a blank numberline



#### <u>Moving from blank numberline to partitioned column method</u> Children should only move on to the column partitioning method when they are secure with using a blank numberline and partitioning. Initially children should only be given addition calculations that do not cross the tens barrier.



8

3

=10

0 +

0+

90+11

5

4

	2	0	Ŧ	3		
+	3	0	+	4		
	5	0	+	7		
				=	5	7

<u>Teachers should make sure that children put one digit in</u> <u>one square as the partitioned column method prepares</u> <u>children to use the column method in year three.</u>

#### Key vocabulary

<u>Key vocabulary</u>: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, addition, column, tens boundary

#### Key skills for addition at year two:

- Add a 2-digit number and ones (e.g. 27 + 6)
- Add a 2-digit number and tens (e.g. 23 + 40)
- Add pairs of 2-digit numbers (e.g. 35 + 47)
- Add three single-digit numbers (e.g. 5 + 9 + 7)
- Show that adding can be done in any order (the commutative law).
- Recall bonds to 20 and bonds of tens to 100 (30 + 70 etc.)
- Count in steps of 2, 3 and 5 and count in tens from any number.
- Understand the place value of 2-digit numbers (tens and ones)
- Compare and order numbers to 100 using < > and = signs.
- Read and write numbers to at least 100 in numerals and words.
- Solve problems with addition, using concrete objects, pictorial representations, involving numbers, quantities and measures, and applying mental and written methods.

### Year Two - Subtraction

Subtract up to two-digit numbers using written methods including columnar subtraction (without carrying or borrowing). Recognise that addition can be done in any order but subtraction cannot

Subtraction using a numberline

Children should understand where to start their subtraction using a numberline. They should understand that they begin on the right side of the page. Once again children should follow the steps carefully to ensure that they understand the method.



#### Key vocabulary

<u>Key vocabulary</u>: equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is\_? difference, count on, strategy, partition, tens, units

#### Key skills for subtraction at year two:

- Recognise the place value of each digit in a two-digit number.
- Recall and use subtraction facts to 20 fluently, and derive and use related facts up to 100.
- Subtract using concrete objects, pictorial representations, 100 squares and mentally, including: a two-digit number and ones, a two-digit number and tens, and two two-digit numbers.
- Show that subtraction of one number from another cannot be done in any order.
- Recognise and use inverse relationship between addition and subtraction, using this to check calculations and missing number problems.
- Solve simple addition and subtraction problems including measures, using concrete objects, pictorial representation, and also applying their increasing knowledge of mental and written methods.
- Read and write numbers to at least 100 in numerals and in words.

<u>Year Two – Multiplication</u>

Use x and = signs to read and write mathematical statements Calculate and write multiplication statements



#### Key vocabulary

**Key vocabulary:** groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times...

#### Key skills for multiplication at year two:

- Count in steps of 2, 3 and 5 from zero, and in 10s from any number.
- Recall and use multiplication facts from the 2, 5 and 10 multiplication tables, including recognising odds and evens.
- Write and calculate number statements using the x and = signs.
- Show that multiplication can be done in any order (commutative).
- Solve a range of problems involving multiplication, using concrete objects, arrays, repeated addition, mental methods, and multiplication facts.
- Pupils use a variety of language to discuss and describe multiplication.

### <u>Year Two – Division</u>

Use ÷ and = signs to read and write mathematical statements Calculate and write division statements

Children should be told to use arrays, pictorial representations and grouping on a numberline.



#### Key vocabulary

Key Vocabulary: share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over

#### Key number skills needed for division at year two:

- Count in steps of 2, 3, and 5 from 0
- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.
- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the x, ÷ and = signs.
- Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.
- Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

### Year Three – Addition

Add numbers with up to 3 digits, using formal written methods of columnar addition.

#### Before performing this method children should:

- Be able to partition a number and recognise the value of each digit.
- Recognise the value of hundred, tens and ones without recording the partitioning.
- Be able to add in columns.

#### Compact Column Addition

To begin with children should build on using the column method for addition without carrying between the tens and ones.



Once secure with this process children can move on to using this method to carry between the tens and ones.



#### Key Vocabulary

<u>Key vocabulary</u>: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, vertical, carry, compact

#### Calculations

- I can add and subtract mentally, including:
  - A 3-digit number and ones
  - A 3-digit number and tens
  - A 3-digit number and hundreds
- I can add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.
- I can estimate the answer to a calculation and use inverse operation to check answers.
- I can solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

### Year Three – Subtraction

Subtract numbers with up to 3 digits, using formal written methods of columnar subtraction

#### Before performing this method children should:

- Recognise the value of hundred, tens and ones without recording the partitioning.
- Be able to add in columns.

#### **Column Subtraction**

To being with children should build on using the column method for subtraction without carrying between the tens and ones.



Once secure with this process children can move on to using this method to carry between the tens and ones.



#### Key Vocabulary

Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is\_? difference, count on, strategy, partition, tens, units exchange, decrease, hundreds, value, digit

#### Calculations

- I can add and subtract mentally, including:
  - A 3-digit number and ones
  - A 3-digit number and tens
  - A 3-digit number and hundreds
- I can add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.
- I can estimate the answer to a calculation and use inverse operation to check answers.
- I can solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

### Year Three – Multiplication

Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for 2-digit times one-digit numbers, first mentally and then progressing to formal written methods.

#### Before performing this method children should:

- Partition numbers into tens and ones.
- Complete multiplication through repeated addition.
- Multiply multiples of ten by a single digit (e.g. 20x4) using their knowledge of multiplication facts and place value.
- Recall and work out multiplication facts in the 2, 3, 4, 5, 8 and 10 time tables.
- Work out multiplication facts not known by repeating addition or other taught method.

#### The Grid Method

Introduce the grid method for multiplying 2-digit by single-digits:

Encourage the children to use the	e.g.	23 x 8 = 184	
column method	Х	20	3
(when applicable) to add the two	8	160	24
answers together to get the total.			

This process can be introduced with the children physically making an array to represent the calculation (e.g. make 8 lots of 23 in 10's and 1's using place value counters or Numicon).

#### Key Vocabulary

<u>Key vocabulary</u>: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated ad-dition, column, row, commutative, sets of, equal groups, times, \_times as big as, once, twice, three times., partition, grid method, multiple, product, tens, units, value

#### Key skills for multiplication: Calculations

- I can recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10x tables.
- I can write and calculate mathematical statements for multiplication and division using the multiplication tables, including for 2-digit numbers, using mental and progressing to formal written methods.
- I can solve problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which n objects are connected to m objects.

### Year Three – Division

Write and calculate mathematical statements for division using the multiplication tables that they know, including for 2-digit times one-digit numbers, using mental and progressing to formal written methods

#### Grouping on a number line

Children continue to work out unknown division facts by grouping on a number line from zero. This should be introduced practically and with arrays, as well as being translated to a number line.



#### Short division

When teaching short division in year three there should be **no remainders or carrying.** Each digit should be multiple of the divisor.



#### Key Vocabulary

Key vocabulary: share, share equally, one each, two each, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, carry, remainder, multiple

#### Key skills for division: Calculations

- I can recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10x tables.
- I can write and calculate mathematical statements for multiplication and division using the multiplication tables, including for 2-digit numbers, using mental and progressing to formal written methods.
- I can solve problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which n objects are connected to m objects.

### Year Four – Addition

Add numbers with up to 4-digits using the formal written methods of columnar addition where appropriate

#### Before performing this method children should:

- Be able to use the column method to add three digit numbers.
- Understand the process of carrying

#### Compact Column Addition

In Year Four the children will use the compact column method, **adding units first**, and 'carrying' numbers **underneath** the calculation.

#### E.g. 3517 + 396 = 3913



#### Key Vocabulary

<u>Key vocabulary</u>: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, vertical, "carry", expanded, compact, thousands, hundreds, digits, inverse

#### Key skills for division:

Calculations

- Select most appropriate method: mental, jottings or written and explain why.
- Recognise the place value of each digit in a four-digit number.
- Round any number to the nearest 10, 100 or 1000.
- Estimate and use inverse operations to check answers.
- Solve 2-step problems in context, deciding which operations and methods to use and why.
- Find 1000 more or less than a given number.
- Continue to practice a wide range of mental addition strategies, i.e. number bonds, add the nearest multiple of 10, 100, 1000 and adjust, use near doubles, partitioning and recombining.
- Add numbers with up to 4 digits using the formal written method of column addition
- Solve 2-step problems in contexts, deciding which operations and methods to use and why.
- Estimate and use inverse operations to check answers to a calculation

### Year Four – Subtraction

Subtract numbers with up to 4-digits using the formal written methods of columnar subtraction where appropriate

#### Before performing this method children should:

- Be able to use the column method to add three digit numbers
- Understand the process of carrying

#### Compact Column Subtraction

In Year Four the children will use the compact column method, **adding units first**, and 'carrying' numbers **underneath** the calculation.



Point to remember The children should be exposed to using this method in a variety of contexts. e.g. money.

#### Key Vocabulary

Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, distance be-

tween, how many more, how many fewer / less than, most, least, count back , how many left, how much less is\_? difference, count on, strategy, partition, tens, units exchange, decrease, hundreds, value, digit, **inverse** 

#### Key skills for subtraction: Calculations

- Subtract by counting on where numbers are close together or they are near to multiples of 10, 100 etc.
- Children select the most appropriate and efficient methods for given subtraction calculations.
- Estimate and use inverse operations to check answers.
- Solve addition and subtraction 2-step problems, choosing which operations and methods to use and why.
- Solve simple measure and money problems involving fractions and decimals to two decimal places.
- Find 1000 more or less than a given number.
- Count backwards through zero, including negative numbers.
- Recognise place value of each digit in a 4-digit number Round any number to the nearest 10, 100 or 1000
- Solve number and practical problems that involve the above, with increasingly large positive numbers.

### Year Four – Multiplication

Multiply 2-digit and 3-digit numbers by 1-digit number using formal written layout

#### Children should have a good understanding of how to:

- Partition numbers into hundred, tens and ones.
- Approximate before they calculate and make this a regular of their calculating, going back to the approximation to check the reasonableness of their answer e.g:
  346 x 9 is approximately 350 x 10 = 3500
- Multiply multiples of ten and one hundred by a single digit, using their multiplication table knowledge.
- All times tables up to 12 x 12

#### Before performing this method children should a good:

• Recall for most multiplication facts in the 12 timetables

#### Long multiplication

Children should be introduced to long multiplication by comparing a grid method calculation to a short multiplication method, to see how the steps are related, but notice how there are less steps involved in the column method.



#### Key Vocabulary

<u>Key vocabulary</u>: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, groups of, sets of, lots of, equal groups, times, multiply, times as big as, once, twice, three times... partition, grid method, total, multiple, product, sets of, **inverse** 

#### Key skills for multiplication:

- Count in multiples of 6, 7, 9, 25 and 1000
- Recall multiplication facts for all multiplication tables up to 12 x 12.
- Recognise place value of digits in up to 4-digit numbers
- Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or to multiply 3 numbers.
- Use commutativity and other strategies mentally  $3 \times 6 = 6 \times 3$ ,  $2 \times 6 \times 5 = 10 \times 6$ ,  $39 \times 7 = 30 \times 7 + 9 \times 7$ .
- Solve problems with increasingly complex multiplication in a range of contexts.
- Count in multiples of 6, 7, 9, 25 and 1000
- Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and units)

### Year Four – Division

Divide 2-digit and 3-digit numbers by 1-digit number using formal written layout

#### Before developing the short division method children should:

• Be secure dividing a two digit number by a one digit number using no remainders - only then can they proceed confidently to the next stage of short division.

#### Short division

(In year four the teacher should continue to develop short division)

Step one	Step two		
Pupil should be secure with the process of short dividing for diving by 2 digits. They should then be taught how to calculate remainders using this to 'carry' remainders within the calculation.	Pupils move onto dividing numbers with up to 3 digits by a single digit. Calculations and problems should not result in final answers having a remainder.		
18	21.8		



#### Key vocabulary

**Key Vocabulary:** share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, "carry", remainder, multiple, divisible by, factor

#### Key number skills needed for division:

- Recall multiplication and division facts for all numbers up to 12 x 12.
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying and dividing by 10 and 100 and 1.
- Pupils practise to become fluent in the formal written method of short division with exact answers when dividing by a one-digit number
- Pupils practise mental methods and extend this to three-digit numbers to derive facts, for example  $200 \times 3 = 600$  so  $600 \div 3 = 200$
- Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as three cakes shared equally between 10 children.

### Year Five – Addition

Add whole numbers with more than 4 digits, including using formal written methods.

#### Column addition

In year five the children should have gained the necessary skills required to use the column method. The teacher should now include money, measures and decimals with different numbers of decimal places.



#### Key vocabulary

<u>Key vocabulary:</u> add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, "carry", expanded, compact, vertical, thousands, hundreds, digits, inverse & decimal places, decimal point, tenths, hundredths, thousandths

#### Key skills for addition:

- Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies ie. add the nearest multiple of 10, 100, 1000 and adjust; use near doubles, inverse, partitioning and re-combining; using number bonds.
- Use rounding to check answers and accuracy.
- Solve multi-step problems in contexts, deciding which operations and methods to use and why.
- Read, write, order and compare numbers to at least 1 million and determine the value of each digit.
- □ Round any number up to 1, 000, 000 to the nearest 10, 100, 1000, 10,000 and 100,000.
- Add numbers with more than 4 digits using formal written method of columnar addition.

### <u>Year five – Subtraction</u>

Subtract whole numbers with more than 4 digits, including using formal written methods.



#### <u>Key vocabulary</u>

<u>Key vocabulary:</u> equal to, take, take away, less, minus, subtract, leaves, distance, between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is\_? Difference, count on, strategy, partition, tens, units exchange, decrease, hundreds, value, digit, inverse, **tenths, hundredths, decimal point, decimal** 

#### Key skills for subtraction:

Subtract numbers mentally with increasingly large numbers.

Use rounding and estimation to check answers to calculations and determine, in a range of contexts, levels of accuracy.

Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.

Read, write, order and compare numbers to at least 1 million and determine the value of each digit.

Count forwards or backwards in steps of powers of 10 for any given number up to 1 million.

Interpret negative numbers in context, counting forwards and backwards with positive and negative integers through zero.

Round any number up to 1 million to the nearest 10, 100, 1000, 10,000 and 100,000

### Year five - Multiplication

Multiply numbers up to 4-digits by a 1 or 2-digit number using a formal written method, including long multiplication for 2-digit numbers

#### Before developing the short division method children should:

Children need to be taught to approximate first, e.g. for 72 x 38, they will use rounding: 72 x 38 is approximately 70 x 40 = 2800, and use the approximation to check the reasonableness of their answer against

#### Long multiplication

Children should be introduced to long multiplication by comparing a grid method calculation to a short multiplication method, to see how the steps are related, but notice how there are less steps involved in the column method.

		$ \longrightarrow $	>
Х	300	20	7
4	1200	80	28



Then move on and introduce long multiplication with two digits



#### Key vocabulary

<u>Key vocabulary</u> groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, \_times as big as, once, twice, three times... partition, grid method, total, multiple, product, inverse, **square, factor, integer, decimal, short/long multi-plication,carry**<sup>4</sup>

#### Key skills for multiplication:

Identify multiples and factors, using knowledge of **multiplication tables to 12x12.** Solve problems where larger numbers are decomposed into their factors Multiply and divide integers and decimals by 10, 100 and 1000 Recognise and use square and cube numbers and their notation Solve problems involving combinations of operations, choosing and using calculations and methods appropriately.

### Year Five – Division

Divide numbers up to 4-digits by a 1-digit number using the formal written method of short division and interpret remainders appropriately for the context

Now that pupils are going to introduced to short division with examples that give rise to remainder answers, division needs to have a real life problem solving context, where **pupils consider the meaning of the remainder and** <u>how</u> to express it, ie. as a fraction, a decimal, or as a rounded number or value, depending upon the context of the problem

Short division with remainders



#### Key vocabulary

**Key Vocabulary:** share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, "carry", remainder, multiple, divisible by, factor, inverse, **quotient, prime number, prime factors, composite number (non-prime)** 

#### Key number skills needed for division:

Recall multiplication and division facts for all numbers up to 12 x 12 (as in Y4).

Multiply and divide numbers mentally, drawing upon known facts.

Identify multiples and factors, including finding all factor pairs of a number, and common factors of two number.

Solve problems involving multiplication and division where larger numbers are decomposed into their factors. Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.

Use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.

Work out whether a number up to 100 is prime, and recall prime numbers to 19.

Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context

Use multiplication and division as inverses.

Interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (e.g.  $98 \div 4 = 24$  r2 =  $24^{1/2}$  =  $24.5 \approx 25$ ).

Solve problems involving combinations of all four operations, including understanding of the equals sign, and including division for scaling by different fractions and problems involving simple rates.

### Year Six – Addition

Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

#### Column addition

Adding several numbers using multiple decimals (including money and measure).

Tenths, hundredths and thousandths should be correctly aligned, with the decimal point lined up vertically including in the answer row.



Children should then move on to adding several numbers with more than 4 digits.

#### Key vocabulary

<u>Key vocabulary:</u> add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, "carry", expanded, compact, vertical, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths

#### Key skills for addition at year six:

- Perform mental calculations, including with mixed operations and large numbers, using and practising a range of mental strategies.
- Solve multi-step problems in context, deciding which operations and methods to use and why.
- Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.
- Read, write, order and compare numbers up to 10 million and determine the value of each digit.
- □ Round any whole number to a required degree of accuracy.
- Pupils understand how to add mentally with larger numbers and calculations of increasing complexity.

### Year Six – Subtraction

12: Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Column subtraction

Children should use the column subtraction method to increasing work with larger and more complex integers.



#### Key vocabulary

Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, dis-tance between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is\_? difference, count on, strategy, partition, tens, units decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal point, decimal

#### Key skills for subtraction at year six:

- Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.
- Read, write, order and compare numbers up to 10 million and determine the value of each digit
- □ Round any whole number to a required degree of accuracy
- Use negative numbers in context, and calculate intervals
- across zero.
- Children need to utilise and consider a range of mental subtraction strategies, jottings and written methods before choosing how to calculate.



#### Key vocabulary

<u>Key vocabulary:</u> groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated ad-dition, array, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times...partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short / long mul-tiplication, "carry", **tenths, hundredths, decimal** 

#### Key skills for multiplication at year six:

- Recall multiplication facts for all times tables up to 12 x 12 (as Y4 and Y5).
- □ Multiply multi-digit numbers, up to 4-digit x 2-digit using long multiplication.
- Perform mental calculations with mixed operations and large numbers.
- Solve multi-step problems in a range of contexts, choosing appropriate combinations of opera-tions and methods.
- □ Estimate answers using round and approximation and determine levels of accuracy.
- Round any integer to a required degree of accuracy.

### Year Six – Division

Divide numbers up to 4-digits by a 2-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. Divide numbers up to 4-digits by a 2-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context.

# $\frac{\text{Short division}}{\text{Short division, for dividing by a single digit: e.g. 6497 \div 8}}$

Short division with remainders: Pupils should continue to use this method, but with numbers to at least 4 digits, and understand how to express

remainders as fractions, decimals, whole number remainders, or rounded numbers. Real life problem solving contexts need to be the starting point, where pupils have to consider the most appropriate way to express the remainder.



Calculating a decimal remainder: In this example, rather than expressing the remainder as  $\underline{r 1}$ , a decimal point is added after the units because there is still a remainder, and the one remainder is carried onto zeros after the decimal point (to show there was no decimal value in the original number). Keep dividing to an appropriate degree of accuracy for the problem being solved.

#### Long division

Children should be taught how to use long division effectively in year six.

#### <u>Key vocabulary</u>

Key Vocabulary: As previously, & common factor

#### Key number skills needed for division at year six:

- Recall and use multiplication and division facts for all numbers to 12 x 12 for more complex calculations
- Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long divi-sion, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. Use short division where appropriate.
- Perform mental calculations, including with mixed operations and large numbers.
- □ Identify common factors, common multiples and prime numbers.
- □ Solve problems involving all 4 operations.
- Use estimation to check answers to calculations and determine accuracy, in the context of a problem.
- Use written division methods in cases where the answer has up to two decimal places.
- □ Solve problems which require answers to be rounded to specified degrees of accuracy.