

## Cranham Church of England (VA) Primary School

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## **Maths Policy**

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Chair of Governing Body:	Mr Edward Buxton	
Headteacher:	Mrs Rebecca Slater	
Responsible Governor:	Dr Charlotte Bigland	
Review Date:		

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## Curriculum Coverage

At Cranham, we follow the National Curriculum and we use MathsNAV to fulfil this requirement. MathsNAV helps teachers to plan coherent learning journeys from Reception through to Year 6.

- The objectives are split into key learning points to ensure they are manageable steps to support children's learning.
- We have additional units to linger longer on important concepts for different year groups – e.g. focusing on securing number bonds up to 20 in Year 1, mental calculation strategies in Year 3, knowing the times tables in Years 3 and 4, decimals in Year 5.
- All units have names that explicitly link to the National Curriculum Strands to support with assessment and tracking.

Cross curricular opportunities for maths are planned in where appropriate and meaningful across the curriculum.

## **Resources and Planning**

We do not use one single set of resources for delivery across the school as we feel that this is limiting and will only expose children to that schemes particular style of maths. Teachers are at liberty to use whichever schemes resources they feel best fits in with the long- and medium-term planning provided through MathsNAV.

Each lesson begins with 'hook it' to engage the children, before moving on to 'teach it' and 'practice it' which are completed as a whole year group. The lessons then move onto 'do it', 'secure it' and 'deepen it' where the children work independently, being supported by teachers and teaching assistants where appropriate.

We also have separate 'fluency' sessions where children independently revisit the skills they have previously learnt or have 1:1 time with a teacher to secure their understanding. It is down to the discretion of the class teacher for when this takes place.

## Assessment

Assessment is carried put in two main ways:

- Continual formative assessment is carried out regularly in lessons and by the teachers.
- Summative assessments completed at the end of each long term (Autumn 2, Spring 2 and Summer 2). The summative assessments are carried out using the White Rose end of term assessments.

Data drops are carried out 6 times a year, at the end of each short term.

- Terms 1, 3 and 5 are based on teacher judgement.
- Terms 2, 4 and 6 are based on summative data gained from the White Rose assessments.

At the end of KS1 and KS2 the children undertake the KS1 and KS2 National curriculum assessments (SATs). At the end of LKS2 all children take part in the Multiplication Tables check.



We are a small voluntary aided school, with a passion for tailoring our provision to allow every child to reach their full potential. Happy children make the best learners, and the staff at Cranham embrace this principle on a daily basis. Our nurturing ethos can be seen throughout the school day, and we are very much a family, learning together.

#### **Subject priorities**

To develop problem solving and reasoning skills in mathematics.

Improving the breadth of questioning from adults and children. Increase children's use of accurate vocabulary.

Ensure all staff know pupil data for their group well to maximise opportunities in learning and to identify gaps.

To ensure that all children improve their quick recall of facts in line with year group expectations

## INTRODUCTION

At Cranham, we believe that Mathematics is an integral part of a child's life. Mathematics teaches children how to make sense of the world around them through developing their ability to calculate, to reason and to solve problems. It enables children to understand and appreciate relationships and pattern in both number and space in their everyday lives. This policy outlines the teaching, organisation and management of the mathematics taught and learnt at Cranham, following the programmes of study from the National Curriculum 2014. The policy has been drawn up as a result of staff discussion and has full agreement of the Governing Body. The implementation of this policy is the responsibility of all the teaching staff.

Classroom practice will be guided by this policy and the Calculation policy. Any classroom practice may be changed from time to time according to government directives.

This policy should be read in conjunction with the calculations policy.

## AIMS

The national curriculum for mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language.
- can solve problems by applying their mathematics to a variety of routine and nonroutine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

In line with these national expectations, we aim to meet them by:

- o Developing problem solving and reasoning skills in mathematics.
- Improving the breadth of questioning from adults and children to increasing children's use of accurate vocabulary.
- Ensuring all staff know pupil data for their group well to maximise opportunities in learning and to identify gaps.
- Ensuring that all children improve their quick recall of facts in line with year group expectations.

In all Key Stages:

- All children have access to quality first teaching.

- All children have the opportunity to use physical resources to develop conceptual understanding.

- Resources include number lines, number squares, multiplication squares, counters, multilink, coins,

fraction walls, Numicon, Dienes apparatus, Cuisenaire, place value counters, dice, playing cards, working walls etc.

### FOUNDATION STAGE

At Cranham the teaching and learning of Mathematics in the Reception Class is initially led by guidelines laid out in the Statutory framework for the early years foundation stage. As the Reception Year progresses, the class teacher's plans allow for a smooth progression into National Curriculum Programmes of Study for KS1.

Their aims are to meet the Early Learning Goals of:

- Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.
- Children use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems. They recognise, create and describe patterns. They explore characteristics of everyday objects and shapes and use mathematical language to describe them.

## KEY STAGE 1

The principal focus of mathematics teaching in key stage 1 is to ensure that pupils develop confidence and mental fluency with whole numbers, counting and place value. This should involve working with numerals, words and the four operations, including with practical resources [for example, concrete objects and measuring tools].

At this stage, pupils should develop their ability to recognise, describe, draw, compare and sort different shapes and use the related vocabulary. Teaching should also involve using a range of measures to describe and compare different quantities such as length, mass, capacity/volume, time and money.

By the end of year 2, pupils should know the number bonds to 20 and be precise in using and understanding place value. An emphasis on practice at this early stage will aid fluency.

Pupils should read and spell mathematical vocabulary, at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

We aim to meet these aims through the breakdown of the National Curriculum into the key learning points as outlined on MathsNAV.

## LOWER KEY STAGE 2

The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers.

At this stage, pupils should develop their ability to solve a range of problems, including with simple fractions and decimal place value. Teaching should also ensure that pupils draw with increasing accuracy and develop mathematical reasoning so they can analyse shapes and their properties, and confidently describe the relationships between them. It should ensure that they can use measuring instruments with accuracy and make connections between measure and number.

By the end of year 4, pupils should have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work. Pupils should read and spell mathematical vocabulary correctly and confidently, using their growing word reading knowledge and their knowledge of spelling.

We aim to meet these aims through the breakdown of the National Curriculum into the key learning points as outlined on MathsNAV.

## UPPER KEY STAGE 2

The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio.

At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them.

By the end of year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages.

Pupils should read, spell and pronounce mathematical vocabulary correctly.

We aim to meet these aims through the breakdown of the National Curriculum into the key learning points as outlined on MathsNAV.

## IMPLEMENTATION PLANNING

In addition to the guidance provided by the school policies for planning there are some particular issues relating to Mathematics.

Through careful planning and preparation, we aim to ensure that throughout the school children are given opportunities for:

- practical activities and mathematical games
- problem solving
- individual, group and whole class discussions and activities
- open and closed tasks
- a range of methods of calculating eg. mental, pencil and paper and using a calculator

Long Term-based planning is based on the National Curriculum.

Medium Term planning is based on the MathsNAV Schemes of work, available at <u>http://mathsnav.com/ks1.html</u>. Reception follow White Rose planning for their structure.

Each class teacher is responsible for the mathematics in their class in consultation with and with guidance from the mathematics subject lead.

The approach to the teaching of mathematics within the school is based on these key principles:

A mathematics lesson every day - each class will teach 5 lessons a week paying attention to the key learning points found within the MathsNAV schemes of work. Each class organises a daily lesson of between 45 and 60 minutes for mathematics.

Teachers of the Reception class base their teaching on objectives in the Framework for Reception; this ensures that they are working towards the 'Early Learning Goals For Mathematical Development'. Towards the end of Reception teachers aim to draw the elements of a daily mathematics lesson together so that by the time children move into Year 1 they are familiar with a 45-minute lesson.

## ASSESSMENT (SEE ALSO ASSESSMENT AND MARKING POLICY)

Staff at Cranham assess progress in Mathematics in a variety of ways:

Short Term assessments are an integral part of every lesson. Their purpose is to check that children have grasped the main teaching points, to correct misunderstandings and to move them on where necessary. They also inform teacher's future planning.

Medium Term assessments take place at the end of each unit. They review and record children's attainment and progress. White Rose end of unit tests can be used to support the class teacher's judgements. These results, along with regular continual assessment are added to the school's electronic tracking and monitoring scheme – INSIGHT.

From Year 1 up, children are formally assessed three times/year using the White Rose end of term tests. This may vary somewhat in years 2 and 6 where past SATs papers may be used instead/as well as. These assessment windows take place at the end of term 1, term 3 and term 5. They assess children against the key objectives and against National Standards.

## EQUAL OPPORTUNITIES (SEE ALSO EQUALITY POLICY)

All children, regardless of gender, race, circumstances or ability have an equal entitlement to access the Mathematics curriculum at an appropriate level. We aim to ensure that Mathematics resources are sensitive to the needs of our children.

- Specific help with number recall or the interpretation of data represented in graphs, tables or bar charts, to compensate for difficulties with long- or short- term memory or with visual discrimination.
- Access to tactile and other specialist equipment for work relating to shape space and measures, to
  overcome difficulties in managing visual information.
- Help in interpreting or responding to oral directions when making mental calculations, to compensate for difficulties in hearing or auditory discrimination.
- Access to equipment or other resources, such as ICT to overcome difficulties in thinking and working in the abstract.

When assessing children their specific individual needs should be taken into account.

## GUIDELINES ON HEALTH AND SAFETY (SEE ALSO HEALTH AND SAFETY POLICY)

Common sense is the key factor in ensuring safe conditions when children are working. At the same time, there is a need to teach pupils inherent dangers in some activities and the safe procedures, which minimize risk.

In mathematics it is important to educate the children in the safe use if equipment, such as a pair of compasses, weights etc.

## LINKS AND THE WIDER CURRICULUM

Mathematics contributes to many subjects within the primary curriculum and opportunities will be sought to draw mathematical experience out of a wide range of activities. This will allow children to begin to use and apply mathematics in real contexts.

## HOME LEARNING

Home learning is set for maths every other week. It will provide opportunities for children to practise and consolidate their skills and knowledge, to develop and extend their techniques and strategies, and to prepare for their future learning. It is down to the class teacher to set and review the home learning.

## **MONITORING AND REVIEW**

The Maths subject leader and class teacher are responsible for monitoring the standard of the children's work and the quality of teaching in Maths through: Learning walks, Pupil conferencing, Book scrutinies and Planning scrutinies. The Maths subject leader is also responsible for supporting colleagues in the teaching of Maths, for being informed about current developments in the subject, and for providing a strategic lead and direction for the subject in the school. The Maths subject leader will present, when appropriate, a subject leader's report to the Head teacher and Governing Board in which they evaluate the strengths and weaknesses in the subject and indicate areas for further improvement.

## **CALCULATION POLICY**

The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Please note that early learning in number and calculation in Reception follows the "Development Matters EYFS document", and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

The aims of the National Curriculum:

Children should:

- become fluent in the fundamentals of mathematics, including varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- solve problems by applying mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions

Mathematics at Cranham C of E Primary School – our objectives:

- To develop problem solving and reasoning skills in mathematics.
- Improving the breadth of questioning from adults and children. Increase children's use of accurate vocabulary.
- Ensure all staff know pupil data for their group well to maximise opportunities in learning and to identify gaps.
- To ensure that all children improve their quick recall of facts in line with year group expectations.

How we achieve this:

- A curriculum plan helps teachers to plan coherent learning journeys from Reception through to Year 6.
- Effective planning, differentiated to the children's needs targeting key groups and individuals
- Practical experiences enabling children to visualise maths concepts
- Effective use of equipment to support and develop attainment
- By teaching calculation methods set out in National Curriculum
- Teaching of mental maths skills to enable mathematical fluency
- Effective deployment of Teaching Assistants to support all learners
- Independent, peer and group mathematics activities (including peer marking for error checking)
- Targeted diagnostics and interventions as necessary

The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, however it is vital that pupils are taught according to the pathway that they are currently working at and children are showing to have 'mastered' a pathway before moving on to the next one. However, children who are showing to be secure in a skill can be challenged to the next pathway as necessary.

## **ADDITION**

#### Reception - combining two groups of objects

Through the White Rose maths scheme, Reception are introduced to some varying methods for addition. It is modelled using concrete resources and they are encouraged to access these independently.

Reception are introduced to part whole models. They discuss how two parts (it can be more) make a whole. The diagram below shows what this would look like in reception and how this is built upon as the near the end of reception/ start year 1.



#### Key vocabulary: add, more, plus, and, make, altogether, equals, double

Key skills for addition at Reception:

- Using quantities and objects, add and subtract two single digit numbers and count on or back to find the answer.
- Count reliably with numbers from 1-20, place them in order and say which is one more or one less than a given number.
- Solve problems involving doubling and halving.

#### Year 1 – Add with numbers up to 20

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



Children should:

- Have access to a wide range of counting equipment, everyday objects, number tracks and number lines, and be shown numbers in different contexts.
- Read and write the addition (+) and equals (=) signs within number sentences.
- Interpret addition number sentences and solve missing box problems, using concrete objects and number line addition to solve them: 8 + 3 = □ □ 5 + 3 + 1 = □ □ + □ = 6

This builds on from prior learning of adding by combining two sets of objects into one group (5 cubes and 3 cubes) in Early Years.

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

Key skills for addition at Y1:

- 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.

#### Year 2 – Add with 2-digit numbers

Developing mental fluency with addition and place value involving 2-digit numbers, then establish more formal methods



To support understanding, pupils may physically make and carry out the calculation with Diennes Base 10 apparatus or place value counters, then compare their practical version to the written form, to help them to build an understanding of it.

**Key vocabulary**: 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 Y2:

- 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 3 – Add numbers with up to 3 digits

Introduce the expanded column addition method:



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

Key skills for addition at Y3:

- Read and write numbers to 1000 in numerals and words.
- Add 2-digit numbers mentally, incl. those exceeding 100.
- Add a three-digit number and ones mentally (175 + 8)
- Add a three-digit number and tens mentally (249 + 50)
- Add a three-digit number and hundreds mentally (381 + 400)
- Estimate answers to calculations, using inverse to check answers
- Solve problems, including missing number problems, using number facts, place value, and more complex addition.
- Recognise place value of each digit in 3-digit numbers (hundreds, tens, ones)
- Continue to practise a wide range of mental addition strategies. i.e. Number Bonds, adding the nearest multiple of 10, 100, 100 and adjusting, using near doubles, partitioning and recombining.

#### Year 4 – Add numbers with up to 4 digits

Move from expanded addition to the compact column method, adding units first, and 'carrying' numbers underneath the calculation. Also include money and measures contexts.

e.g. 3517 + 396 = 3913



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

Key skills for addition at Y4:

- 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 practise a wide range of mental addition strategies. ie. 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 5 – Add numbers with more than 4 digits

Including money, measures and decimals with different numbers of decimal places.

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+	£	7	•	55
€	3	ļ	•	14

The decimal point should be aligned in the same way as the other place value columns and must be in the same column in the answer. (Keep reminding pupils about the line under the final calculation)

Numbers should exceed 4 digits.



Children should understand the place value of tenths and hundredths and use this to align numbers with different numbers of decimal places.

**Key Vocabulary:** 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 Y5:

- Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies. i.e. Add the nearest multiple of 10, 100, 100 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.

#### Year 6 – Add several numbers of increasing complexity



Adding several numbers with different numbers of decimal places (including money and measures):

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

Zeros could be added into any empty decimal places, to show there is no value to add.

Empty decimal places can be filled with zero to show the place value in each column.

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Adding several numbers with more than 4 digits.

**Key Vocabulary:** 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 Y6:

- 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.

## **SUBTRACTION**

#### Reception – count on or back to find the answer.

Subtraction in reception involves the use of concrete resources in order to solve the calculations. They are introduced to tens frames in order to aid them in subtracting a single digit number from a single digit number.



Key Vocabulary: take away, less, how many more / how many less, count back, most, least

Key skills for subtraction at Reception:

- Using quantities and objects, add and subtract two single digit numbers and count on or back to find the answer.
- Count reliably with numbers from 1-20, place them in order and say which is one more or one less than a given number.
- Solve problems involving doubling and halving.



#### Mental subtraction

Children should start recalling subtraction facts up to and within 10 and 20 and should be able to subtract zero.

**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.

Key skills for subtraction at Y1:

- 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 (i.e. bead string, objects, cubes) and pictures, and missing number problems
- Read and write numbers from 0 to 20 in numerals and words.

#### Year 2 – Subtract with 2-digit numbers

Subtract on a number line by counting back, aiming to develop mental subtraction skills.

This strategy will be used for:

- 2-digit numbers subtract units (by taking away / counting back) e.g. 36-7
- 2-digit numbers subtract tens (by taking away / counting back) e.g. 48-30
- Subtracting pairs of 2-digit numbers (see below:)



Mental strategy - subtract numbers close together by counting on:



Many mental strategies are taught. Children are taught to recognise that when numbers are close together, it is more efficient to count on the difference. They need to be clear about the relationship between addition and subtraction.

**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

Key skills for subtraction at Y2:

- 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.

#### Year 3 – Subtracting with 2 and 3-digit numbers

Introduce partitioned column subtraction method.

$\begin{array}{r llllllllllllllllllllllllllllllllllll$	When learning to exchange, explore partitioning in different ways so that pupils understand that when you exchange, the VALUE is the same i.e. $72 = 70+2 = 60+12$ = 50+22 etc. Emphasise that the value hasn't changed, we have just partitioned it in a different way.			
STEP 2: introduce 72 - 47 exchanging" through practical subtraction. Make the larger number with Base 10, then subtract 47 from it. 670 + 12 - 40 + 7 20 + 5 = 25				
STEP 3: Once pupils are secure with the understanding of exchanging, they can use the partitioned column method to subtract any 2 and 3-digit numbers.238101010	$ \begin{array}{c} - 1 4 6 = 92 \\ + 3 0 + 8 \\ + 4 0 + 6 \\ + 9 0 + 2 \end{array} $			

Counting on as a mental strategy for subtraction:

Continue to reinforce counting on as a strategy for close-together numbers (e.g. 121—18), and also for numbers that are nearly multiples of 10, 100, 1000 or £'s, which make it easier to count on (e.g. 102-89, 131—79, or calculating change from £1 etc.).Start at the smaller number and count on in tens first, then count on in units to find the rest of the difference:



**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

Key skills for subtraction at Y3:

- Subtract mentally a: 3-digit number and ones, 3-digit number and tens, 3-digit number and hundreds
- Estimate answers and use inverse operations to check
- Solve problems, including missing number problems
- Find 10 or 100 more or less than a given number
- Recognise the place value of each digit in a 3-digit number
- Counting up differences as a mental strategy when numbers are close together or near multiples of 10
- Read and write numbers up to 1000 in numerals and words
- Practise mental subtraction strategies, such as subtracting near multiples of 10 and adjusting (e.g. subtracting 19 or 21), and select most appropriate methods to subtract, explaining why.

#### Year 4 – Subtract with up to 4-digit numbers

Partitioned column subtraction with exchanging (decomposition):



#### Mental strategies

A variety of mental strategies must be taught and practised, including counting on to find the difference where numbers are closer together, or where it is easier to count on.

**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, inverse.

Key skills for subtraction at Y4:

- 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 5 – Subtract with at least 4-digit numbers

Including money, measures and decimals.



**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, inverse, tenths, hundredths, decimal point, decimal.

Key skills for subtraction at Y5:

- 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 0
- Round any number up to 1 million to the nearest 10, 100, 1000, 10 000 and 100 000.



Pupils should be able to apply their knowledge of a range of mental strategies, mental recall skills, and informal and formal written methods when selecting the most appropriate method to work out subtraction problems.

**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, inverse, tenths, hundredths, decimal point, decimal.

Key skills for subtraction at Y6:

- 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.

#### Year 1 - Multiply with concrete objects, arrays and pictorial representations



There are 3 sweets in one bag.

How many sweets are in 5 bags altogether?



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.

#### Key Vocabulary: groups of, lots of, times, array, altogether, multiply, count.

Key skills for multiplication at Y1:

- 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 2 – Multiply using arrays and repeated addition (using at least 2s, 5s and 10s)



**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 Y2:

- 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.

#### Year 3 – Multiply 2-digit numbers by a single digit number

Introduce the grid method for multiplying 2-digit numbers by a single digit number



Introduce the grid method with children physically making an array to represent the calculation (e.g. make 8 lots of 23 with 10s and 1s place value counters), then translate this to grid method format.

To do this, children must be able to:

- Partition numbers into tens and units
- Multiply multiples of ten by a single digit (e.g. 20 x 4) using their knowledge of multiplication facts and place value
- Recall and work out multiplication facts in the 2, 3, 4, 5, 8 and 10 times tables.
- Work out multiplication facts not known by repeated addition or other taught mental strategies (e.g. by commutative law, working out near multiples and adjusting, using doubling etc.) Strategies to support this are: repeated addition using a number line, bead bars and arrays:



**Key Vocabulary:** groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, 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 at Y3:

- Recall and use multiplication facts for the 2, 3, 4, 5, 8 and 10 multiplication tables, and multiply multiples of 10
- Write and calculate number statements using the multiplication tables they know, including 2-digit x single-digit, drawing upon mental methods, and progressing to reliable written methods
- Solve multiplication problems, including missing number problems
- Develop mental strategies using commutativity (e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240)
- Solve simple problems in contexts, deciding which operations and methods to use
- Develop efficient mental methods to solve a range of problems e.g using commutativity

#### Year 4 - Multiply 2 and 3-digit numbers by single digits

Using all multiplication tables up to 12 x 12.

Developing the grid method



Children should be able to:

- Approximate before they calculate, and make this a regular part 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
- Record an approximation to check the final answer against
- Multiply multiples of ten and one hundred by a single-digit, using their multiplication table knowledge
- Recall all times tables up to 12 x 12.

**Key Vocabulary:** groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times, \_times, as big as, once, twice, three times..., partition, grid method, multiple, product, tens, units, value, inverse

Key skills for multiplication at Y4:

- 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 x 6 = 6 x 3 , 2 x 6 x 5 = 10 x 6 , 39x7 = 30 x 7 + 9 x 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 ones)

Introducing column multiplication

Introduce 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.

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.



**Key Vocabulary:** groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times, \_times, as big as, once, twice, three times..., partition, grid method, multiple, product, tens, units, value, inverse, square, factor, integer, decimal, short/long multiplication, 'carry'

Key skills for multiplication at Y5:

- 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 6 - Short and long multiplication as in Y5, and multiply decimals with up to 2 decimal places by a single digit



Children will be able to:

- Use rounding and place value to make approximations before calculating and use these to check answers against.
- Use short multiplication (see Y5) to multiply numbers with more than 4-digits by a single digit; to multiply money and measures, and to multiply decimals with up to 2d.p. by a single digit.
- Use long multiplication (see Y5) to multiply numbers with at least 4 digits by a 2-digit number.

**Key Vocabulary:** groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times, \_times, as big as, once, twice, three times..., partition, grid method, multiple, product, tens, units, value, inverse, square, factor, integer, decimal, short/long multiplication, 'carry', tenths, hundredths, decimal

Key skills for multiplication at Y6:

- 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 operations and methods
- Estimate answers using round and approximation and determine levels of accuracy
- Round any integer to a required degree of accuracy.

## DIVISION

#### Year 1 – Group and share small quantities

Use objects, diagrams and pictorial representations to solve problems involving both grouping and sharing.



Pupils 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

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

Key skills needed for division at Y1:

- 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 2 – Group and share using the ÷ and = sign

Use objects, arrays, diagrams and pictorial representations, and grouping on a number line.



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

Key skills needed for division at Y2:

- 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.



# **Key vocabulary:** share, share equally, one each, two each..., group, 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 needed for division at Y3:

- Recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables (through doubling, connect the 2, 4 and 8s)
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- Solve problems, in contexts, and including missing number problems, involving multiplication and division
- Pupils develop efficient mental methods, for example, using multiplication and division facts (e.g. using 3 x 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 x 2 = 60, so 60 ÷ 3 = 20 and 20 = 60 ÷ 3)
- Pupils develop reliable written methods for division, starting with calculations of 2-digit numbers by 1-digit numbers and progressing to the formal written method of short division.

#### Year 4 – Divide up to 3-digit numbers by a single digit, without remainders initially

Short division should only be taught once children have secured the skills of calculating remainders.



**Key vocabulary:** share, share equally, one each, two each..., group, 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 skills needed for division at Y4:

- 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 x 3 = 600 so 600 ÷ 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 5 – Divide up to 4-digit numbers by a single digit, including those with remainders

Short division, including remainders



If children are confident and accurate:

- Introduce long division for pupils who are ready to divide any number by a 2-digit number (e.g. 2678 ÷ 19). This is a Y6 expectation — see Y6

**Key vocabulary:** share, share equally, one each, two each..., group, 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, quotient, prime number, prime factors, composite number (non-prime)

Key skills needed for division at Y5:

- 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 ÷ 4 = 24 r 21 =2 24 / = 24.5 ≈ 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.



**Key vocabulary:** share, share equally, one each, two each..., group, 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, quotient, prime number, prime factors, composite number (non-prime), common factor.

Key skills needed for division at Y6:

- 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 division, 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.