

Towngate Primary Academy
Maths Calculation Policy 2020/2021



Our Mathematics curriculum at Towngate Primary Academy

This calculation policy has been developed and agreed after using the National Curriculum objectives and methods.

This calculation policy sets out the methods that children will be taught and encouraged to use when tackling calculations as part of their daily numeracy lessons and during their work in a wide range of cross-curricular and real-life contexts. The policy reflects our belief that the methods taught should make sense to children and should be both efficient and reliable.

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 non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

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What makes a Mathematician?

A definition of a Mathematician:

- Someone who can see patterns;
- Someone who shows deeper application;
- Someone who identifies and understands the interconnectivity of concepts and demonstrates this through the transfer of skills;
- Someone who is systematic and resilient and can extend their own learning.

Developing Mastery in Mathematics

At the center of the mastery approach to the teaching of mathematics is the belief that all children have the potential to succeed with the correct level of challenge and support. At Towngate Primary Academy, we have to avoid shallow mastery and ensure that we help children to embed concepts so they can apply their understanding of mathematical strategies and concepts. In order to achieve this, children's learning is deepened to build a conceptual understanding by tackling a range of challenge and varied problems.

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Mathematics Teaching and Learning

To support the teaching and learning of all pupils in the subject of mathematics, at Towngate Primary Academy, we work with the following planning documents and resources to provide a well-rounded and deep learning experience for all of our pupils:

- White Rose Maths Hub Schemes of Learning (EY - Y6 and mixed-age planning)
- Abacus Textbooks
- NRich Problem Solving
- NCETM to develop reasoning
- Times Table Rockstars (paper and online platform for home access)

Class teachers supplement and stretch pupils' learning by utilising a wide range of recommended mathematical resources within lesson time to provide a broad, balanced and contextual curriculum.

At Towngate Primary Academy, we believe that in order to develop confident, competent and resilient young mathematicians, our pupils benefit from following a mathematical journey to further explore and discover mathematical concepts. To ensure consistency across school, our pupils' learning is deepened by following a clear sequence of learning opportunities:

fluency → reasoning → problem solving

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Fluency

One of the three aims of the National Curriculum states that pupils (of all ages, not just primary children) will:

“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.”

Fluency is more than simply practicing a calculation or following a procedure; fluency relies on demonstrating an efficient approach to mathematics; choosing to use efficient strategy that can be carried out easily and quickly. Fluency demands accuracy and sound understanding of key number facts, concepts and relationships whilst relying on flexibility to understand that maths can be presented in a number of different ways. Fluency demands more of pupils than simply memorising a single procedure – they need to understand *why* they are doing what they are doing and *know when it is appropriate* to use different methods.

A key element of fluency is procedural variation: to be confident mathematicians, pupils need to see maths in a variety of different ways – using key concepts to apply what they already know to new learning.

Reasoning

The second aim of the National Curriculum indicates that pupils will:

“reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language.”

Effective reasoning relies on using and applying prior knowledge to a given context or problem. Reasoning requires logical thinking to tackle a challenging concept – allowing time to try different strategies to reach a given outcome. In practice, through reasoning focused lessons, pupils develop their ability to select appropriate strategies to solve a problem, to draw logical conclusions, to develop and explain solutions / methods and to reflect on their own mathematic challenges and successes. In order for our pupils to reason accurately, we use a range of

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different question stems to promote discussion and discovery. Some of these include: spot the mistake, find the odd one out, what's the same – what's different, convince me etc. When learners are able to explain and justify their learning and mathematical choices, these skills can be transferred into isolated problem solving investigations and opportunities.

Problem Solving

The third aim of the National Curriculum programme of study for mathematics explains that pupils can:

"can solve problems by applying their 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."

Problem solving allows opportunities for pupils to apply their understanding to isolated concepts. Through effective problem solving, pupils are able to make sense of mathematics through exploring 'real world' contextual problems; by applying knowledge of a given skill, pupils are able to gain a better understanding of the modern world around them. Problem solving allows for pupils to seek solutions, explore patterns, formulate conjectures.

Through problem solving, pupils learn to take risks in their learning, to persevere in a task and experience success.

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Foundation Stage Mathematics

Practitioners in Foundation Stage follow the mathematics strands from the Early Years Foundation Stage Framework and support this with Maths Hub schemes of learning. Children are supported in developing their understanding of mathematics (number calculation, shape, space and measure) in a broad range of contexts in which they can explore, enjoy, learn, practice and talk about their developing understanding. Children are actively engaged in their learning in order to process it meaningfully. This is promoted through focus activities and the children's individual interests.

By the end of foundation stage children are expected to:

- *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.*
- *Use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems. They recognize, create and describe patterns. They explore characteristics of everyday objects and shapes and use mathematical language to describe them.*

The classroom environment provides real life practical opportunities to support the application of mathematics. Focus teaching is based around real life scenarios, rhymes, songs and books. Practical apparatus such as real life objects, Numicon and links are used to support this in both focus teaching input and through classroom choice provision.

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Year 1 Age Related Expectations

Addition

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

Key skills for addition at Year 1:

- 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.

Subtraction

Key vocabulary: *equal to, take, take away, less, minus, subtract, leaves, half, distance between, how many more, how many fewer / less than, most, least, count back, missing number, how many left, how much less is_?*

Key skills for subtraction at Year 1:

- 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.

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Multiplication

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

Key skills for multiplication at Year1:

- 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.**

Division

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

Key number skills needed for division at Year 1:

- 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 Age Related Expectations

Addition

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, one more, ten more, one hundred more, tens boundary

Key skills for addition at Year 2:

- 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.

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, one less, ten less, one hundred less

Key skills for subtraction at Year 2:

- 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.

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- 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.

Multiplication

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 2:

- 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.

Division

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 2:

- 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, \div and = signs.

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- 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.

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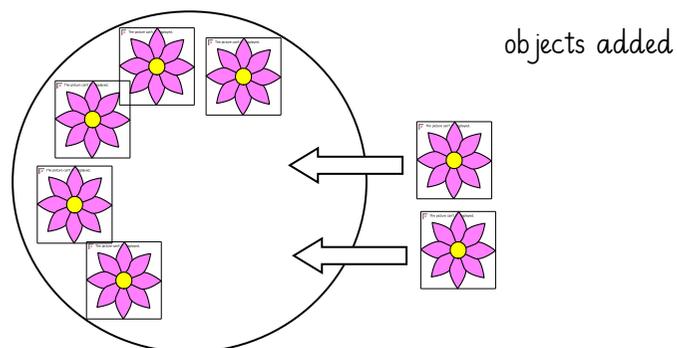
KSI- Addition

Children are introduced to addition as the adding of objects to another **set**¹ of objects.

For example, for the calculation **five add two**,

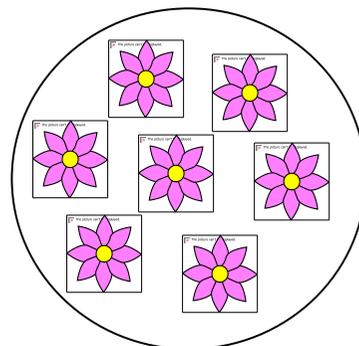
Children physically add objects to a set

like this:



The new set would look like this.

Children record pictorially:



1 a **set** is a group of objects which can be described using a number eg 3 beads is a set

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The next step is for children to complete a 'number sentence²' by writing the correct numerals in the boxes.

For example, for the sum **five add two**, the children would be given:

add is the same as altogether

add is the same as altogether

The words are then replaced by **symbols**:

+ =

The children will be taught that the **digit**³ '5' stands for a number of objects.

It is important to stress that the '=' sign means 'is the same number as'

So: $5 + 2$ is the same number as 7

2 a **number sentence** is a set of numbers and symbols that make mathematical sense eg $15 + 3 = 18$ or $3 \times 4 = 12$

3 a **digit** is any number symbol from 0 to 9

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Children are taught that the same total is made whichever order the numbers are added **in**.

Children are taught that the same total is made whichever order the numbers are added in **any order**: the **commutative**⁴ property of addition:

So $5 + 2 = 7$ and $2 + 5 = 7$

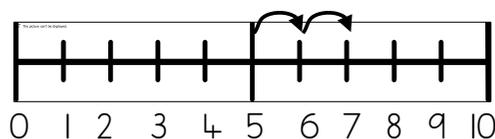
Children are taught to read number sentences where the numbers and symbols are positioned as follows:

$$\begin{array}{ll} 5 + 2 = 7 & 7 = 5 + 2 \\ 2 + 5 = 7 & 7 = 2 + 5 \end{array}$$

Children are taught that to add one number to another mentally they should **hold the largest number** in their heads and **count on the smallest number**. The children will say: '5 6, 7'

At the same time children use a **number line**⁵ to perform addition calculations.

For example, for the sum 'five add two' children use the number line like this:



They start at 5, make two jumps forward (add 2) then finish at 7.

They record this as before: $5 + 2 = 7$

4 The **commutative** property of addition means that the numbers can be added in any order to give the same total

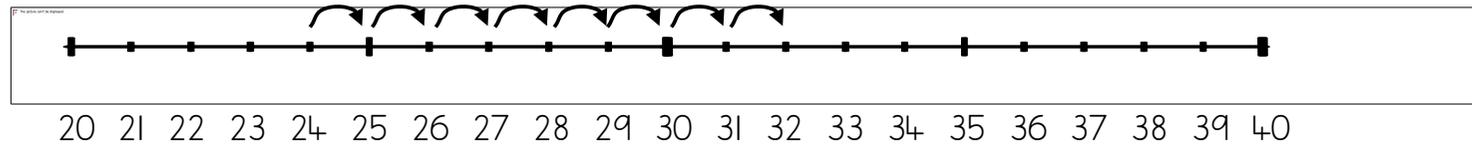
5 a **number line** represents a set of consecutive numbers eg 0 to 10, 100 to 200, -30 to 0 etc

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At first children use number lines with numbers from 0 to 10 then move on to lines with numbers from 0 to 20
When adding using numbers from 20 to 100 children use relevant sections of a number line:

eg: $24 + 8$



They record the calculation as: $24 + 8 = 32$



Addition bonds to 10 and 20

Children should know addition pairs that make 10 so that they can use their knowledge in their calculations. Children are taught the pattern made by the numbers:

	$10 + 0 = 10$
	$9 + 1 = 10$
	$8 + 2 = 10$
	$7 + 3 = 10$
	$6 + 4 = 10$
	$5 + 5 = 10$
	$4 + 6 = 10$
	$3 + 7 = 10$
	$2 + 8 = 10$
	$1 + 9 = 10$
	$0 + 10 = 10$

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Children are taught to use the above addition pairs to quickly add three numbers where two of the numbers total 10.

For example: $3 + 7 + 5 =$
10

When children know that $3 + 7 = 10$ they only need to add the remaining number - 5: $3 + 7 + 5 = 15$

The same pattern is seen for addition pairs that total 20.

Addition of two 2-digit numbers

In preparation for the addition of two- and three- digit numbers children are taught to recognise the pattern in our number system:

For example:

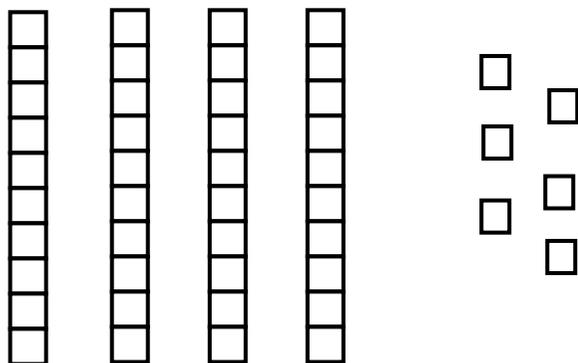
5	+	2	=	7
50	+	20	=	70
500	+	200	=	700
5000	+	2000	=	7000

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When learning how to add two **2-digit numbers**⁶ children are taught how to break up or **partition**⁷ numbers. This is shown visually

For example 46 is partitioned as 4 tens and 6 ones - 40 and 6



Children write this as

46
/ \
10 |
10 |
10 |
10 |
 |
 |

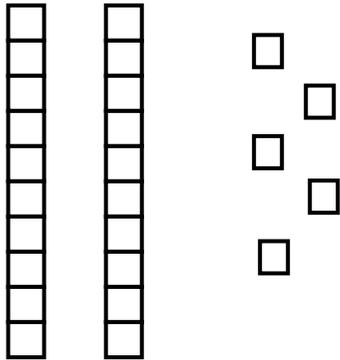
⁶ a **2-digit number** is any number between 10 and 99

⁷ see note on page 6

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25 is partitioned as 20 and 5



Children write this as

$$\begin{array}{r} 25 \\ / \quad \backslash \\ 10 \quad | \\ 10 \quad | \\ \quad | \\ \quad | \\ \quad | \end{array}$$

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Children are taught to **add the tens first**

For example $46 + 25 =$

$$40 + 20 = 60$$

$$6 + 5 = 11$$

71

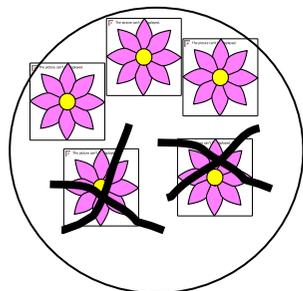
$$\text{So } 60 + 11 = 71$$



KSI Subtraction

Subtraction by taking away

Children are introduced to subtraction as removing ('taking away') objects from a set. They are taught to cross out the number of objects to be 'taken away' from a set and write the number of objects left.



For example: 5 flowers take away 2 flowers leaves

3

 flowers

The words are then replaced by numerals to record subtraction calculations:

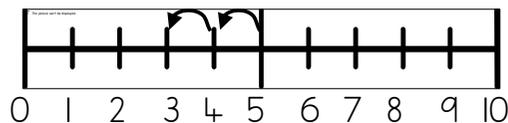
For example: $5 - 2 = 3$

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The children are introduced to a number line to perform subtraction calculations. This helps them to understand that subtraction is the opposite (inverse) of addition.

For example: 'five take away two'



They start at 5, make two jumps backwards (take away two) and finish on 3.

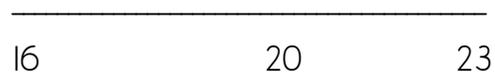
They record: $5 - 2 = 3$

The children also use a number line to count forward from the smaller number:

For example $23 - 16 =$

Children put the smallest number at the start of the number line and count on to the largest number.

16 to the larger number: **23** as this is faster and more reliable than counting back from **23** to **16**.



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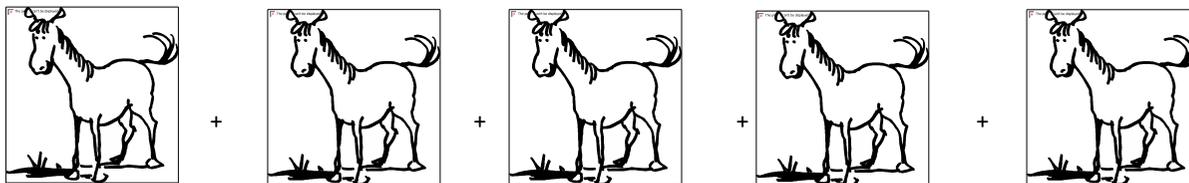


KSI- Multiplication

Multiplication is taught as **repeated addition**⁸.

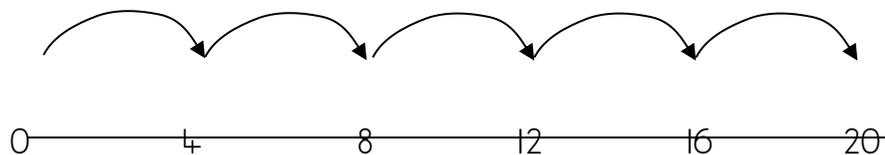
Initially, children record their calculations using pictures.

eg: How many legs on 5 horses?



$$4 + 4 + 4 + 4 + 4$$

This can be modelled on the number line:



⁸ **repeated addition** is the adding of two or more of the same number eg 3×5 is the same as $5 + 5 + 5$

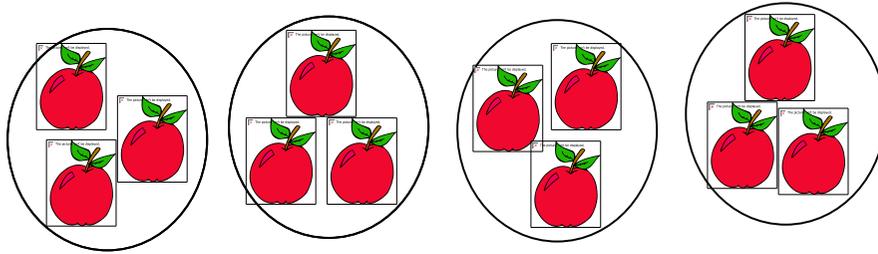
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Before using the multiplication symbol 'x' children use the terms:

'groups of' 'lots of' 'sets of' 'bags of' etc emphasising 'of'

eg 4 **groups** of 3, 4 **lots** of 3, 4 **sets** of 3 etc



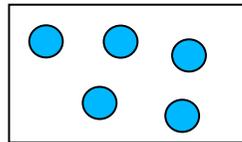
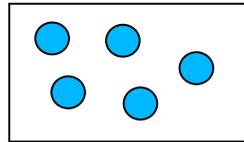
4 groups of 3 make 12 altogether OR $3 + 3 + 3 + 3 = 12$

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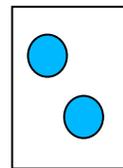
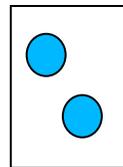
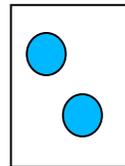
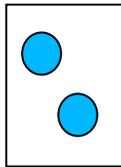
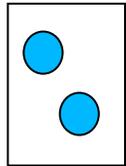


Children are taught that when multiplying, the answer is the same whichever way round the multiplication is written:

For example:



2 groups of 5 is the same as



5 groups of 2

$$2 \times 5 = 5 \times 2 = 10$$

This **commutative**⁹ property of multiplication is also taught through the use of '**arrays**'¹⁰

eg

*	*	*	*
*	*	*	*
*	*	*	*
	*	*	*

$$3 \text{ rows of } 4 = 4 \text{ rows of } 3$$
$$3 \times 4 = 4 \times 3 = 12$$

⁹ see note on page 4

¹⁰ an **array** is a 2 dimensional picture of a multiplication or division fact eg $2 \times 3 = 6$ and $6 \div 2 = 3$

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KSI Division

Division is the **inverse**¹¹ of multiplication.

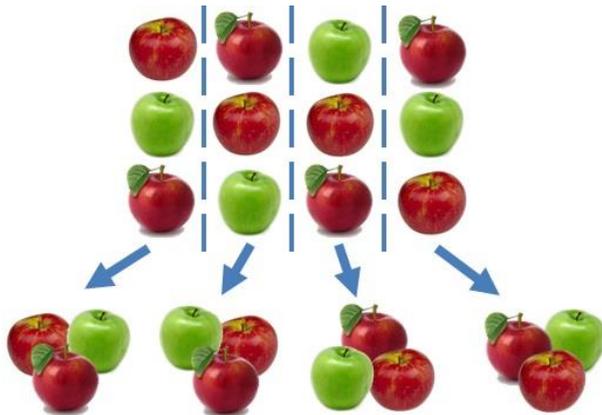
Children are introduced to the two aspects of division, namely:

- division as **sharing**
- division as making **equal groups**

The appropriate approach will depend on the context of the problem presented to the children.

At first, children use pictures to record their calculations:

eg 'Share 12 apples among 4 people'



12 apples shared among 4 people = 3 apples each

This is **division by sharing**. The answer is always the number of **items** in a group.

¹¹ Like addition and subtraction, division and multiplication are **inverses** (they undo each other's actions)



Year 3 Age Related Expectations

Addition

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, vertical, 'carry', expanded, compact

Key skills for addition at Year 3:

- 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, ie. number bonds, adding the nearest multiple of 10, 100, 1000 and adjusting, using near doubles, partitioning and recombining.

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 exchange, decrease, hundreds, value, digit

Key skills for subtraction at Year 3:

- 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.

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- 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 (see examples above)
- 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.

Multiplication

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 Year 3:

- 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. $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$)
- 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
($4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$) and for missing number problems $? \times 5 = 20$, $3 \times ? = 18$,
 $? \times ? = 32$

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Division.

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 number skills needed for division at Year 3:

- 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 $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 = 6 \div 3$) to derive related facts ($30 \times 2 = 60$, so $60 \div 3 = 20$ and $20 = 60 \div 3$).
- 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 Age Related Expectations

Addition

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, vertical, „carry“, expanded, compact, thousands, hundreds, digits, inverse

Key skills for addition at Year 4:

- 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, 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.

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 exchange, decrease, hundreds, value, digit, inverse

Key skills for subtraction at Year 4:

- 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.

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- 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.

Multiplication

Key vocabulary: 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 at Year 4:

- 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)

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Division

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 at Year 4:

- Recall multiplication and division facts for all numbers up to 12×12 .
- 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.

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LKS2- Addition

Formal column method for addition

For example $368 + 493$

$$\begin{array}{r} 368 \\ + 493 \\ \hline 861 \\ \hline \end{array}$$

Starting at Units: $8+3 = 11$, 1 unit and 1 ten to put into 10's column.

Tens: $60+90+10=160$, 6 tens and 1 hundred to put into 100's column.

Hundreds: $300+400+100=800$

Talking about the value of the numbers ensures that the children do not think they are 'carrying one'.

Addition of decimal numbers

Children need to have a secure understanding of the place value of the numbers involved:

For example 46.53 is made up of:

4 tens, 6 units, 5 tenths, 3 hundredths

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Addition of numbers that have one decimal place

Children are introduced to addition of numbers that have one decimal place in the context of money:

For example: $46 \cdot 7 + 37 \cdot 8$

In the context of money: 46 and 37 are £s

In the context of money: $\cdot 7$ and $\cdot 8$ are seen as 70p and 80p

$$\begin{array}{r} 46.70 \\ + 37.80 \\ \hline 84.50 \\ \hline \end{array}$$

Always start with the lowest value: hundredths or pennies to explain the concept.

This is the discussion around the calculating:-

$$0+0 \text{ hundredths} = 0$$

$$70+10 \text{ tenths} = 150 \text{ or } 1.50$$

$$6+7+1 = 14$$

$$40+3+10 = 80$$

so 50 to stay in tenths column
and £1.00 or 1 whole unit to units column.
4 units and 1 ten.

If the number of pence is greater than 100, children need to understand that there is an additional pound.

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LKS2- Subtraction

Formal column method for subtraction

For example: $365 - 246 =$

$$\begin{array}{r} ^5 ^1 \\ 365 \\ - 246 \\ \hline 119 \end{array}$$

Always start with the smallest units: units

5 subtract 6

Without going into negative numbers I have not got enough so I need to take a ten from the 10's column.

This makes it 350+15 which still equals 365. Children need to understand that the number is not being changed.

Now $15-6=9$

Move onto tens column:

$50-40=10$

So that is 1 ten in the tens column.

Move onto hundreds column:

$300-200=100$ So that is 1 hundred in the hundreds column.

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Subtraction involving decimal numbers

Children are introduced to subtraction of numbers that have one decimal place in the context of money:

For example: $96.4 - 24.6$

In the context of money: 96 and 24 are £s

In the context of money: $.4$ and $.6$ are seen as 40p and 60p

The calculation becomes: $£96.40 - £24.60$

$$\begin{array}{r} \overset{5}{9}\overset{1}{6}.40 \\ - 24.60 \\ \hline 71.80 \end{array}$$

Always start with the smallest units: hundredths or pennies in this case

$$0-0=0$$

Move onto tenths or 10 pences:

$4-6=$ Without going into negative numbers I have not got enough so I need to take 1 unit or 1 pound to help me do this. This becomes $95.00 + 1.40 = 96.40$. The number is not being changed.

Now $1.40-0.60$ (one pound forty subtract 60 pence) = 0.80

Move onto units or pounds:

$$5-4=1$$

Move onto tens or ten pounds:

$$90-20=70$$

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Once children understand subtraction in the context of money they need to apply their knowledge and understanding to perform any subtraction calculation involving numbers with 2 decimal places.

For example: $96.43 - 24.61$

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LKS2- Multiplication

Formal column method for multiplication- Expanded

For example: $53 \times 4 =$

$$\begin{array}{r} 53 \\ \times 4 \\ \hline 12 \\ 200 \\ \hline 212 \end{array}$$

$4 \times 3 = 12$ (unit \times unit)
 $4 \times 50 = 200$ (unit \times tens)

$$\begin{array}{r} 235 \\ \times 8 \\ \hline 40 \\ 240 \\ 1600 \\ \hline 1880 \end{array}$$

$8 \times 5 = 40$ (unit \times unit)
 $8 \times 30 = 240$ (unit \times tens)
 $8 \times 200 = 1600$ (unit \times hundreds)

Children should begin by writing down \times calculations they have done so mistakes can be easily identified. When accuracy improves these can be left out.



Short multiplication

24 × 6 becomes

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ \hline 2 \end{array}$$

Answer: 144

342 × 7 becomes

$$\begin{array}{r} 342 \\ \times 7 \\ \hline 2394 \\ \hline 21 \end{array}$$

Answer: 2394

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LKS2- Division

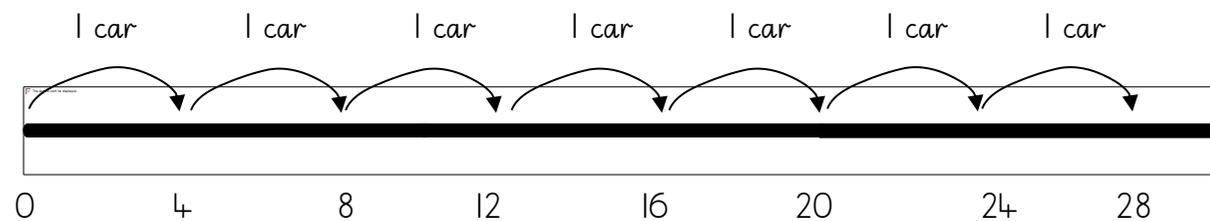
Children are taught to use a number line for division calculations.

Children use a blank number line and write on the significant numbers.

Eg

There are 28 children. 4 children can fit into a car. How many cars are needed?

$$28 \div 4 =$$



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Formal method of dividing

Short Division.

For example $152 \div 4 =$

$$4 \overline{)152}$$

How many 4's in 1 = 0 (record above the 1 and then move the 1 onto the next number.

$$\begin{array}{r} 038 \\ 4 \overline{)152} \end{array}$$

How many 4's in 15 = $3 \times 4 = 12$ with 3 remainder which I put with my next number.

How many 4's in 32 = $4 \times 8 = 32$

$432 \div 5$ becomes

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

Answer: 86 remainder 2



Year 5 Age Related Expectations

Addition

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 Year 5:

- Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies i.e. 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.

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 exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal point, decimal

Key skills for subtraction at Year 5:

- 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.

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- 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.

Multiplication

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..., partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short/long multi-plication, 'carry'

Key skills for multiplication at Year 5:

- 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.

Division

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 at Year 5:

- 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.

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- 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. $98 \div 4 = 24 \text{ r}2 = 24\frac{1}{2} = 24.5 \approx 25$).
- 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 6 Age Related Expectations

Addition

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 Year 6:

- 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

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 Year 6:

- 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.

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Multiplication

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, 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 multiplication, „carry“, tenths, hundredths, decimal

Key skills for multiplication at Y6:

- Recall multiplication facts for all times tables up to 12×12 (as Y4 and Y5).
- Multiply multi-digit numbers, up to 4-digit \times 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

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), common factor.

Key number skills needed for division at Year 6:

- Recall and use multiplication and division facts for all numbers to 12×12 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.

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- 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.

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UKS2- Addition

Formal column method for addition

For example $13,682 + 14,932$

$$\begin{array}{r} 13682 \\ + 14932 \\ \hline 28614 \\ \hline \end{array}$$

Starting at Units: $2 + 2 = 4$

Tens: $80 + 30 = 110$, 1 ten and 1 hundred to put into 100's column.

Hundreds: $600 + 900 + 100 = 1600$, 6 hundreds and 1 thousand to put into 1000's column.

Thousands: $3000 + 4000 + 1000 = 8000$

Ten Thousands: $10,000 + 10,000 = 20,000$

Talking about the value of the numbers ensures that the children do not think they are 'carrying one'.

Addition of decimal numbers

Children need to have a secure understanding of the place value of the numbers involved:

For example 46.53 is made up of:

4 tens, 6 units, 5 tenths, 3 hundredths

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Addition of numbers that have two decimal places

Children are introduced to addition of numbers that have two decimal places also in the context of money:

For example: £46 • 53 + £31 • 28

$$\begin{array}{r} 46.53 \\ + 31.28 \\ \hline 77.81 \\ | \end{array}$$

Always start with the lowest value: hundredths or pennies to explain the concept.

This is the discussion around the calculating:-

3+8 hundredths/pennies	= 11	1 penny or hundredth and 1 ten pence.
50+20+10	= 80	No need to move columns as it is below a whole one.
6+1	= 7	units or pounds.
40+30	= 70	pounds or tens.

If the number of pence is greater than 100, children need to understand that there is an additional pound.

NB In calculations where one of the numbers 'shows' more numbers after the decimal point than the other(s), children should use '0' as the 'place holder'

For example: If the calculation given is $57.2 + 29.43$, children should understand that the first number can be recorded as 57.20 (the '0' representing no hundredths).

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UKS2- Subtraction

Formal column method for subtraction

For example: $15,365 - 13,246 =$

$$\begin{array}{r} ^5 ^1 \\ 15\cancel{3}65 \\ - 13246 \\ \hline \underline{\underline{2119}} \end{array}$$

Always start with the smallest units: units

5 subtract 6

Without going into negative numbers I have not got enough so I need to take a ten from the 10's column.

This makes it 350+15 which still equals 365. Children need to understand that the number is not being changed.

Now $15-6=9$

Move onto tens column:

$50-40=10$

So that is 1 ten in the tens column.

Move onto hundreds column:

$300-200=100$

So that is 1 hundred in the hundreds column.

Move onto thousands column:

$5000-3000=2000$

So that is 2 thousand in the thousand column.

Move onto ten thousands column:

$10,000-10,000=0$

So that is 0 ten thousands in the ten thousands column.

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Subtraction involving decimal numbers

Children are introduced to subtraction of numbers that have two decimal places in the context of money:

For example:

$$96.43 - 24.61$$

$$\begin{array}{r} ^5 ^1 \\ 96.43 \\ - 24.61 \\ \hline 71.82 \end{array}$$

Always start with the smallest units: hundredths or pennies:

$$3-1=2$$

Move onto tenths or 10 pences:

$$40-60= \quad \text{Without going into negative numbers I have not got enough so I need to take 1 unit or } \pounds 1 \text{ from my number.}$$
$$\text{Now } 1.40-0.60 = 0.80$$

Move onto units or £1:

$$5-4=1$$

Move onto tens or £10:

$$90-20=70$$

Once children understand subtraction in the context of money they need to apply their knowledge and understanding to perform any subtraction calculation involving numbers with 2 decimal places.

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UKS2- Multiplication

Formal column method for multiplication- Expanded

For children who are not secure with their knowledge of place value, they will use the expanded method for multiplication.

	2741	
x	6	
	<hr/>	
	6	$6 \times 1 = 6$ (unit x unit)
	240	$6 \times 40 = 240$ (unit x tens)
	4200	$6 \times 700 = 4200$ (unit x hundreds)
	<u>12000</u>	$6 \times 2000 = 12000$ (unit x thousands)
	<hr/>	
	16446	
	<hr/>	

Children should begin by writing down x calculations they have done so mistakes can be easily identified. When accuracy improves these can be left out.



Short multiplication

2741 × 6 becomes

$$\begin{array}{r} 2741 \\ \times \quad 6 \\ \hline 16446 \\ \hline \end{array}$$

Answer: 16 446

Long multiplication

24 × 16 becomes

$$\begin{array}{r} 24 \\ \times 16 \\ \hline 144 \\ 240 \\ \hline 384 \\ \hline \end{array}$$

Answer: 384



Multiplication of numbers with decimals

Formal method of multiplying numbers with one decimal place

This is introduced in the context of money to help with understanding.

For example: £22.3 x 4

In the context of money: 22 is £22 and .3 is 30p

	22.30	
x	4	
	<hr/>	
	0	4 x 0 pennies = 0
	1.20	4 x 0.30 = 1.20 (4 x 30p = £1.20)
	8.00	4 x 2.00 = 8.00
	<hr/>	
	80.00	4 x 20.00 = 80.00
	<hr/>	
	89.20	

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UKS2- Division

Formal method of dividing

Short Division

For example $4152 \div 4 =$

$$4 \overline{)4152}$$

How many 4's in 4 = 1 - record above the 4.

How many 4's in 1 = 0 - record above the 1 and move the 1 onto the next number.

$$\begin{array}{r} 1038 \\ 4 \overline{)4152} \end{array}$$

How many 4's in 15 = $3 \times 4 = 12$ with 3 remainder which I put with my next number.

How many 4's in 32 = $4 \times 8 = 32$



Long division by chunking

For example $972 \div 36 =$

To find out how many 36's are in 972 by using key facts.

Starting by using multiplication facts they know.

$$\begin{array}{r} \overline{27} \\ 36 \overline{)972} \\ \underline{-720} \quad 20 \times \\ 252 \\ \underline{-180} \quad 5 \times \\ 72 \\ \underline{ 72} \quad 2 \times \quad (\text{add these}) \\ 0 \quad 27 \end{array}$$

Where remainders occur, children express them as fractions, decimals or use rounding depending upon the problem.

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Times tables expectations

Towngate Primary Academy believe that when children are proficient in times tables it enables them to calculate more efficiently. Expectations within each year group:

Year 1

Children to be able to count in 2's, 10's and 5's

Year 2

Children to be able to count in 2's, 10's, 5's and 3's. Summer term to introduce 4's.
Inverse methods taught.

Year 3

Children to be able to count in 2's, 10's, 5's, 3's, 4's and 8's. Summer term to introduce 6's.
Inverse methods taught.

Year 4

Children to be confident in all times tables and inverse.
Statutory multiplication check in Spring term.

Year 5 & 6

Rapid recall of all times tables and inverse.

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Progress coverage – Mathematics

Expectations for progress: **Place value**

Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Recognise some numerals of personal significance.	Count, read and write numbers to 100 in numerals.	Recognise the place value of each digit in a two-digit number.	Recognise the place value of each digit in a three-digit number.	Recognise the place value of each digit in a four-digit number.	Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero.	Use negative numbers in context, and calculate intervals across zero.
Recognises numerals 1 to 5.	Read and write numbers to 20 in numerals and words.	Compare and order numbers from 0 up to 100; use $<$, $>$ and $=$ signs.	Compare and order numbers up to 1000.	Order and compare numbers beyond 1000.	Read, write, order and compare numbers up to 1 000 000 and determine the value of each digit.	Read, write, order and compare numbers up to 10 000 000 and determine the value of each digit.
Counts up to three or four objects by saying one number name for each item.	Partition 2 digit numbers into tens and units.	Identify, represent and estimate numbers using different representations, including the number line.	Identify, represent and estimate numbers using different representations.	Round any number to the nearest 10, 100 or 1000.	Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000.	Round any whole number to a required degree of accuracy.
Counts actions or objects, which cannot be moved.	Identify and represent numbers using objects and pictorial representations including the number line.	Read and write numbers to at least 100 in numerals and in words.	Read and write numbers to 1000 in numerals and in words.	Identify, represent and estimate numbers using different representations.	Read Roman numerals to 1000 (M) and recognise years written in Roman numerals.	
Counts objects to 10, and beginning to count beyond 10.				Read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value.	Recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3).	
Counts out up to six objects from a larger group.						

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Expectations for progress: **Addition**

Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Counting in ones, 1:1 correspondence starting from difference numbers – up to 20.	Count to, read and write numbers across 100.	Use partitioning and add 2 digit number.	Partition using columns for addition – involve crossing 10 then 100.	Formal column method of addition (4 digit numbers).	Introduce adding decimal in a column.	Add negative integers.
Adding 2 groups together by counting and counting on.	Number bonds 10, 20 & 100.	Apply written methods as well as concrete objects.	Extend to 4 digit numbers when secure.	Involve 2 step problems.	Read, write & compare numbers to at least 1,000,000.	Consolidating & applying knowledge to solve problems.
Uses the language of 'more' and 'fewer' to compare two sets of objects.	Add 1 & 2 digit numbers to 20 including 0.	Adding 3 digit numbers using partitioning.	Extend children who are ready to formal column method	Adding 3 lots of four digit numbers.	Interpret negative numbers in context, calculate intervals across zero.	
Says the number that is one more than a given number.	Solve one step problems that involve addition using concrete objects and mentally.	Understanding of commutative law in relation to addition.	Counting in multiples of 4, 8, 50 & 100. (6, 7, 9, 25 & 1000 extension)	Doubling & halving 2, 3 & 4 digit number (odd numbers).	Solve number problems & practical problems.	
In practical activities and discussion, beginning to use the vocabulary involved in addition.	Doubling & halving simple numbers.	Use inverse to check missing number problems.	Compare & order number to 1000 (and beyond).			
	Missing & number problems.	Doubling & halving including multiples of 12.	Solve number and practical problems involving these ideas.			
	Use language of equal to, more than.	Extend mental maths strategies to include number bonds.				
	Add simple 2 digit numbers together					
	Given a number, identify one more and one less.					

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Expectations for progress: **Subtraction**

Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Physically taking away using numbers up to 20.	Subtract by finding the difference on a number line.	Subtract by finding the difference on a number line.	Subtract by finding the difference on a number line.	Subtract using formal column method.	Subtract using formal column method.	Subtract using formal column method.
Using number lines with physical objects.	Numbers should extend as children become more confident. This then needs applying to problems both written and practical.	Begin to do larger jumps of 10 or 2.	Use a number line to make bigger jumps. Mixture of numbers counting onto the next whole 10, 100.	Application to number challenges using inverse to check.	Decimals (as money)	Decimals (as money)
Uses the language of 'more' and 'fewer' to compare two sets of objects.	Missing number sentences.	Extension work to involve 3 digit numbers.	Extend children who are ready to formal column method.		Application to number challenges using inverse to check.	Application to number challenges using inverse to check.
In practical activities and discussion, beginning to use the vocabulary involved in subtraction.	Application to number challenges using inverse to check.	Application to number challenges using inverse to check.	Doubling / halving 2, 3 and 4 digit number.			
			Application to number challenges using inverse to check.			

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Expectations for progress: **Multiplication**

Year 1	Year 2	Year 3	Year 4	Year 5 & Year 6
Solve simple one step problems involving 'group of' concrete and pictorial objects.	2, 5, 10 times table and understand it as repeated addition.	Children should know all times tables by end of year.	Consolidate all times tables.	Consolidate all times tables.
	Learn these tables, extend to 3, 4 when confident.	Introduce multiplication in formal method. 2 by 1 digit	Formal column multiplication methods	Multiply multi digit numbers up to 4 digit whole numbers using formal method.
	Solve problems using materials, array & repeated addition.	Application to number challenges. Real life situations & problems.	2 & 3 digit x 1 digit. Extend to 4 digits in columns.	Multiply decimal numbers by 10, 100 and 1000.
	Calculate simple number sentences using table they know – begin to use grid method with higher ability.		Application to number challenges. Real life situations & problems.	Identify multiples, factors, common factors and prime numbers.
	Understand cumulative law with x link to +.			Recognise squared and cubed numbers.
	Application to number challenges. Real life situations & problems.			Application to number challenges. Real life situations & problems.

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Expectations for progress: **Division**

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Solve simple one step problems involving division using concrete / pictorial objects.	Share between physically into groups, then put onto a number line.	Divide using formal method starting at 0.	Use place value to recall multiplication and division facts for all tables.	Use place value to recall multiplication and division facts for all tables.	Use place value to recall multiplication and division facts for all tables.
Using sharing to understand the concept.	Larger numbers.	Calculate with small remainders when confident.	Divide mentally using known facts.	Divide mentally using known facts.	Divide mentally using known facts.
Application into number challenges, use invers of known x tables to check answers.	Simple remainders.	Larger number.	Use times tables to divide by 2 & 3 digit number.	Use times tables to divide 4 digit by 2 & 3 digit numbers.	Use times tables to divide 4 digit by 2 & 3 digit numbers.
	To understand the inverse to prove it.	Apply to fractions.		Give remainders as a fraction / decimal.	Use knowledge of BODMAS to carry out calculations.
	Application into number challenges, use invers of known times tables to check answers.	Application into number challenges, use invers of times tables to check answers.			Give remainders as a fraction / decimal.

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Expectations for progress: Fractions

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Recognise, find and name a half as one of two equal parts of an object, shape or quantity.	Recognise, find, name and write fractions $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{4}$ and $\frac{3}{4}$ of a length, shape, set of objects or quantity.	Count up or down in tenths.	Count up or down in hundredths.	Recognise mixed numbers and improper fractions and convert from one to the other.	Use common factors to simplify fractions.
Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity.	Write simple fractions and recognise the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$.	Recognise that tenths arise from dividing an object into 10 equal parts and in dividing one digit numbers of quantities by 10.	Recognise that hundredths arise from dividing an object by 100 and dividing tenths by 10.	Write mathematical statements > 1 as a mixed number.	Use common multiples to express fractions in the same denomination.
		Compare and order unit fractions and fractions with the same denominators.	Recognise and show, using diagrams, families of common equivalent fractions.	Compare and order fractions whose denominators are all multiples of the same number.	Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.
		Recognise and show, using diagrams, equivalent fractions with small denominators.	Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number.	Identify, name and write equivalent fractions of a given fraction, representing visually, including tenths and hundredths.	Multiply simple pairs of proper fractions, writing the answer in its simplest form.
		Recognise, find and write fractions of a discrete set of objects with small denominators.	Add and subtract fractions with the same denominator.	Add and subtract fractions with the same denominator and denominators that are multiples of the same number.	Divide proper fractions by whole numbers.
		Add and subtract fractions with the same denominator within one whole.	Solve simple measure and money problems involving fractions and decimals to two decimal places.	Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.	
		Solve problems using all fraction knowledge.			

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Expectations for progress: **Decimals and percentages**

Year 4	Year 5	Year 6
Recognise and write decimal equivalents of any number of tenths or hundredths	Read and write decimal numbers as fractions	Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction
Recognise and write decimal equivalents to $1/4$, $1/2$ and $3/4$	Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents	Identify the value of each digit in numbers given to three decimal places
Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths	Round decimals with two decimal places to the nearest whole number and to one decimal place.	Multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places.
Round decimals with one decimal place to the nearest whole number	Read, write, order and compare numbers with up to three decimal places	Multiply one-digit number with up to two decimal places by whole numbers
Compare numbers with the same number of decimal places up to two decimal places	Recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal	See written division methods in cases where the answer has up to two decimal places
	Solve problems involving number up to three decimal places	Solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison
	Solve problems which require knowing percentage and decimal equivalents of $1/2$, $1/4$, $1/5$, $2/5$, $4/5$ and those fractions with a denominator of a multiple of 10 or 25	Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.
		Solve problems, which require answers to be rounded to specified degrees of accuracy.
		Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.

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Expectations for progress: **Measurement**

Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
They use past, present and future forms accurately when talking about events that have happened or are to happen in the future. They develop their own narratives and explanations by connecting ideas or events.	Compare, describe and solve practical problems for: length/height, weight/mass, capacity/volume & time.	Choose and use appropriate standard units to estimate and measure length/height (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels.	Measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml).	Convert between different units of measure estimate, compare and calculate different measures, including money in pounds and pence.	Convert between different units of metric measure.	Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate.
Can describe their relative position such as 'behind' or 'next to'.	Measure and begin to record length/height, weight/mass, capacity/volume & time.	Compare and order lengths, mass, volume/capacity and record the results using >, < and =.	Measure the perimeter of simple 2-D shapes.	Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres.	Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints.	Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places.
Orders two or three items by length, height, weight or capacity.	Recognise and know the value of different denominations of coins and notes.	Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value.	Add and subtract amounts of money to give change, using both £ and p in practical contexts.	Find the area of rectilinear shapes by counting squares.	Estimate volume and capacity.	Convert between miles and kilometres.
Uses familiar objects and common shapes to create and recreate patterns and build models.	Sequence events in chronological order using language recognise and use language relating to dates, including days of the week, weeks, months and years.	Find different combinations of coins that equal the same amounts of money.	Tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks.	Convert between different units of measure (e.g. Hours to minutes).	Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres.	Recognise that shapes with the same areas can have different perimeters and vice versa.
Uses everyday language related to time.	Tell the time to the hour and half past the hour and draw the hands on a clock face to show these times.	Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change.	Estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, a.m./p.m., morning, afternoon, noon and midnight.	Read, write and convert time between analogue and digital 12- and 24-hour clocks.	Calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm ²) and square metres (m ²) and estimate the area of irregular shapes.	Recognise when it is possible to use formulae for area and volume of shapes.
Beginning to use everyday language related to money.		Compare and sequence intervals of time	Know the number of seconds in a minute and the number of days in each month, year and leap year and compare durations of events.	Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.	Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling.	Calculate the area of parallelograms and triangles.
Orders and sequences familiar events.		Tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times.			Solve problems involving converting between units of time.	Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm ³) and cubic metres (m ³), and extending to other units.
Measures short periods of time in simple ways		Know the number of minutes in an hour and the number of hours in a day.				

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Expectations for progress: **Geometry**

Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
They recognise, create and describe patterns.	Recognise and name common 2-D shapes (e.g. Square, circle, triangle) .	Identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line.	Identify horizontal and vertical lines and pairs of perpendicular and parallel lines.	Compare and classify geometric shapes, including quadrilaterals and triangles, based on properties and sizes.	Use the properties of rectangles to deduce related facts and find missing lengths and angles.	Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius.
They explore characteristics of everyday objects and shapes and use mathematical language to describe them.	Recognise and name common 3-D shapes (e.g. Cubes, cuboids, pyramids & spheres).	Compare and sort common 2-D and 3-D shapes and everyday objects.	Draw 2D shapes.	Identify lines of symmetry in 2-D shapes presented in different orientations.	Distinguish between regular and irregular polygons based on reasoning about equal sides and angles.	Compare and classify geometric shapes based on their properties and sizes.
	Describe position, direction and movement, including whole, half, quarter and three-quarter turns.	Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces.	Make 3-D shapes using modelling materials.	Complete a simple symmetric figure with respect to a specific line of symmetry.	Identify 3-D shapes, including cubes and other cuboids, from 2-D representations.	Draw 2-D shapes using given dimensions and angles and recognise, describe and build simple 3-D shapes, including making nets.
		Identify 2-D shapes on the surface of 3-D shapes.	Recognise 3-D shapes in different orientations and describe them.	Identify acute and obtuse angles and compare and order angles up to two right angles by size.	Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles.	Find unknown angles in any triangles, quadrilaterals, and regular polygons.
		Compare and sort common 2-D and 3-D shapes and everyday objects.	Recognise angles as a property of shape or a description of a turn.	Describe positions on a 2-D grid as coordinates in the first quadrant.	Draw given angles, and measure them in degrees ($^{\circ}$).	Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.
		Order and arrange combinations of mathematical objects in patterns and sequences.	Identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn.	Describe movements between positions as translations of a given unit to the left/right and up/down.	Identify angles at a point and one whole turn (total 360°); at a point on a straight line and \square a turn (total 180°) and identify other multiples of 90° .	Describe positions on the full coordinate grid (all four quadrants).
		Use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and $1/4$ turns.	Identify whether angles are greater or less than right angle.	Plot specified points and draw sides to complete a given polygon.	Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed.	Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.

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Vocabulary coverage – Mathematics

“The national curriculum for mathematics reflects the importance of spoken language in pupils’ development across the whole curriculum – cognitively, socially and linguistically. The quality and variety of language that pupils hear and speak are key factors in developing their mathematical vocabulary and presenting a mathematical justification, argument or proof. They must be assisted in making their thinking clear to themselves as well as others, and teachers should ensure that pupils build secure foundations by using discussion to probe and remedy their misconceptions.”

National Curriculum in England, Department for Education, 2013

Using correct mathematical language is crucial for thinking, learning and communicating mathematically. Children may build knowledge through remembering information that they hear, but it is only when they put these ideas into their own words that it becomes clear whether concepts have been learned effectively. It is in listening to children talking about mathematics that we, as teachers, can best assess what they are actually learning and understanding. This enables us to identify and address any misconceptions that might be developing.

We need to encourage children to explain what they are doing and why they are doing it. We must offer them opportunities to use mathematical language frequently, for example by participating in paired activities, group discussions and games as well as other dialogues. This will help children to learn new vocabulary, to use words they already know more accurately, and to express new ideas and new thinking.

It is important to introduce children to the correct vocabulary at the appropriate time and within a suitable context. It is often helpful to do this using relevant real-life objects, mathematical manipulatives and visual representations such as pictures and diagrams. All children need regular, planned opportunities to develop their mathematical vocabulary in order that they become familiar with the language and are not confused by mathematical terms. They need to acquire the words necessary for them to take part in lessons and activities, respond to questions correctly and carry out tasks successfully. Fun games and activities, such as the following example, can be a useful way to rehearse words and their meanings regularly.

Please note: progression through each year group’s vocabulary is intended to build on that taught in the previous year group.

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	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Number	<p>zero</p> <p>number</p> <p>one, two, three ... to twenty and beyond</p> <p>teens numbers, eleven, twelve ... twenty</p> <p>none</p> <p>how many ...?</p> <p>count, count (up) to, count on (from, to), count back (from, to)</p> <p>count in ones, twos, fives, tens</p> <p>is the same as</p> <p>more, less</p> <p>odd, even</p> <p>few</p> <p>pattern</p> <p>pair</p>	<p>In addition to all previous vocabulary...</p> <p>numeral</p> <p>two hundred ... one thousand</p> <p>forwards</p> <p>backwards</p> <p>equal to</p> <p>equivalent to</p> <p>most, least</p> <p>many</p> <p>multiple of</p>	<p>In addition to all previous vocabulary...</p> <p>twenty-one, twenty-two ... one hundred, two hundred ... one thousand</p> <p>tally</p> <p>sequence</p> <p>continue</p> <p>predict</p> <p>pair, rule</p> <p>> greater than</p> <p>< less than</p>	<p>In addition to all previous vocabulary...</p> <p>count in ones, twos, fives, tens, threes, fours, eights, fifties and so on to hundreds</p> <p>multiple of, factor of</p> <p>relationship</p> <p>Roman numerals</p>	<p>In addition to all previous vocabulary...</p> <p>ten thousand, hundred thousand, million</p> <p>count in ones, twos, fives, tens, threes, fours, eights, fifties, sixes, sevens, nines, twenty-fives to hundreds</p> <p>next, consecutive</p> <p>integer, positive, negative</p> <p>above/below zero, minus</p> <p>negative numbers</p>	<p>In addition to all previous vocabulary...</p> <p>factor pair</p> <p>\geq greater than or equal to</p> <p>\leq less than or equal to</p> <p>formula</p> <p>divisibility</p> <p>square number</p> <p>prime number</p> <p>ascending, descending order</p>	<p>In addition to all previous vocabulary...</p> <p>factorise</p> <p>prime factor</p> <p>digit total</p>
Place Value	<p>ones</p> <p>tens</p> <p>digit</p> <p>the same number as, as many as</p>	<p>In addition to all previous vocabulary...</p> <p>equal to</p> <p>half-way between</p> <p>above, below</p>	<p>In addition to all previous vocabulary...</p> <p>hundreds</p>	<p>In addition to all previous vocabulary...</p> <p>one hundred more</p> <p>one hundred less</p>	<p>In addition to all previous vocabulary...</p> <p>one thousand more</p> <p>one thousand less</p>	<p>Consolidate previously taught</p>	<p>Consolidate previously taught</p>

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	<p>more, larger, bigger, greater</p> <p>fewer, smaller, less</p> <p>fewest, smallest, least</p> <p>most, biggest, largest, greatest</p> <p>one more, ten more</p> <p>one less, ten less</p> <p>compare</p> <p>order</p> <p>size</p> <p>first, second, third... twentieth</p> <p>last, last but one</p> <p>before, after</p> <p>next</p> <p>between</p>		<p>one-, two- or three-digit number</p> <p>place, place value</p> <p>stands for, represents</p> <p>exchange</p> <p>twenty-first, twenty-second ...</p>				
Estimating	<p>guess</p> <p>how many ...?</p> <p>estimate</p> <p>nearly</p> <p>close to</p> <p>about the same as</p> <p>just over, just under</p> <p>too many, too few</p> <p>enough, not enough</p>	<p>In addition to all previous vocabulary...</p> <p>roughly</p>	<p>In addition to all previous vocabulary...</p> <p>exact, exactly</p>	<p>In addition to all previous vocabulary...</p> <p>approximate, approximately</p> <p>round, nearest, round to the nearest ten, hundred</p> <p>round up, round down</p>	<p>In addition to all previous vocabulary...</p> <p>round to the nearest thousand</p>	<p>In addition to all previous vocabulary...</p> <p>round to the nearest ten thousand</p>	<p>Consolidate previously taught</p>
Addition and subtraction	<p>add, more, and</p> <p>make, sum, total</p>	<p>In addition to all previous vocabulary...</p>	<p>In addition to all previous vocabulary...</p>	<p>In addition to all previous vocabulary...</p>	<p>In addition to all previous vocabulary...</p>	<p>In addition to all previous vocabulary...</p>	<p>Consolidate previously taught</p>

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	<p>altogether double one more, two more ... ten more how many more to make ...? how many more is ... than ...? how much more is ...? take away how many are left/left over? how many have gone? one less, two less, ten less ... how many fewer is ... than ...? how much less is ...? difference between</p>	<p>addition near double half, halve subtract equals is the same as number bonds/pairs missing number</p>	<p>one more, two more ... ten more ... one hundred more one less, two less, ten less ... one hundred less number bonds/pairs/facts tens boundary</p>	<p>hundreds boundary</p>	<p>inverse</p>	<p>tens boundary hundreds boundary ones boundary tenths boundary</p>	
<p>Multiplication and division</p>	<p>sharing doubling halving number patterns</p>	<p>In addition to all previous vocabulary ... multiplication multiply multiplied by multiple division dividing grouping array</p>	<p>In addition to all previous vocabulary ... groups of times once, twice, three times ... ten times repeated addition divide, divided by, divided into</p>	<p>In addition to all previous vocabulary ... factor product remainder</p>	<p>In addition to all previous vocabulary ... inverse square, squared cube, cubed</p>	<p>Consolidate previously taught</p>	<p>Consolidate previously taught</p>

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			share, share equally left, left over one each, two each, three each ... ten each group in pairs, threes ... tens equal groups of row, column multiplication table multiplication fact, division fact				
Fractions (including decimals, percentages, ratio and proportion)	parts of a whole half quarter	In addition to all previous vocabulary ... fraction equal part equal grouping equal sharing one of two equal parts one of four equal parts	In addition to all previous vocabulary ... equivalent fraction mixed number numerator, denominator two halves two quarters, three quarters one third, two thirds one of three equal part	In addition to all previous vocabulary ... sixths, sevenths, eighths, tenths ...	In addition to all previous vocabulary ... hundredths decimal, decimal fraction, decimal point, decimal place, decimal equivalent proportion	In addition to all previous vocabulary ... proper/improper fraction equivalent, reduced to, cancel sixths, sevenths, eighths, tenths ... hundredths, thousandths in every, for every percentage, per cent, %	In addition to all previous vocabulary ... ratio
Algebra							formula formulae equation unknown variable
Measurement	measure size	In addition to all previous vocabulary ...	In addition to all previous vocabulary ...	In addition to all previous vocabulary ...	In addition to all previous vocabulary ...	In addition to all previous vocabulary ...	Consolidate previously taught

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	compare guess, estimate enough, not enough too much, too little too many, too few nearly, close to, about the same as just over, just under	measurement roughly	measuring scale	division of a scale approximately	unit, standard unit metric unit	imperial unit	
Length	metre length, height, width, depth long, short, tall high, low wide, narrow thick, thin longer, shorter, taller, higher ... and so on longest, shortest, tallest, highest ... and so on far, near, close	In addition to all previous vocabulary... centimeter ruler meter stick	In addition to all previous vocabulary... further, furthest tape measure	In addition to all previous vocabulary... millimeter, kilometer, mile distance apart ... between ... to ... from perimeter	In addition to all previous vocabulary... breath edge area covers square centimetre (cm ²)	In addition to all previous vocabulary... square centimetre (cm ²), square metre (m ²), square millimetre (mm ²)	In addition to all previous vocabulary... yard, foot, feet, inch, inches circumference
Weight	weigh, weighs, balances heavy, light heavier than, lighter than heaviest, lightest scales	In addition to all previous vocabulary... kilogram, half kilogram	In addition to all previous vocabulary... gram	Consolidate previously taught	In addition to all previous vocabulary... mass: big, bigger, small, smaller weight: heavy/light, heavier/lighter, heaviest/lightest	Consolidate previously taught	In addition to all previous vocabulary... tonne pound ounce

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Capacity and volume	full empty half full holds container	In addition to all previous vocabulary... litre, half litre capacity volume more than less than quarter full	In addition to all previous vocabulary... millimeter contains	Consolidate previously taught	In addition to all previous vocabulary... measuring cylinder	In addition to all previous vocabulary... pint, gallon	In addition to all previous vocabulary... centilitre cubic centimetres(cm ³), cubic metres (m ³), cubic millimetres (mm ³), cubic kilometres (km ³)
Temperature			temperature degree	centigrade			
Time	time days of the week, Monday, Tuesday ... day, week birthday, holiday morning, afternoon, evening, night bedtime, dinner time, playtime today, yesterday, tomorrow before, after next, last now, soon, early, late quick, quicker, quickest, quickly slow, slower, slowest, slowly old, older, oldest	In addition to all previous vocabulary... months of the year (January, February ...) seasons: spring, summer, autumn, winter day, week, weekend, month, year earlier, later next, first, last midnight date how long ago? how long will it be to ...? how long will it take to ...? how often? always, never, often, sometimes	In addition to all previous vocabulary... fortnight 5, 10, 15... minutes past digital/analogue clock/watch, timer seconds	In addition to all previous vocabulary... century calendar earliest, latest a.m, p.m Roman numerals 12-hour clock time, 24- hour clock time	In addition to all previous vocabulary... leap year millennium noon date of birth timetable arrive, depart	Consolidate previously taught	In addition to all previous vocabulary... Greenwich Mean Time, British Summer Time, International Date Line

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	new, newer, newest takes longer, takes less time hour, o'clock clock, watch, hands	usually once, twice hour, o'clock, half past, quarter past, quarter to clock, clock face, watch, hands hour hand, minute hand hours, minutes					
Money	money coin penny, pence, pound price, cost buy, sell spend, spent pay	In addition to all previous vocabulary... change dear, costs more cheap, costs less, cheaper costs the same as how much ...? how many ...? total	In addition to all previous vocabulary... bought sold	Consolidate previously taught	Consolidate previously taught	In addition to all previous vocabulary... discount currency	In addition to all previous vocabulary... profit loss
Properties of shape	shape, pattern flat curved, straight round hollow, solid sort make, build, draw size bigger, larger, smaller	In addition to all previous vocabulary... symmetry, symmetrical, symmetrical pattern	In addition to all previous vocabulary... surface line symmetry	In addition to all previous vocabulary... perimeter	In addition to all previous vocabulary... line construct sketch center angle, right-angled base, square-based reflect, reflection regular, irregular	In addition to all previous vocabulary... radius, diameter congruent axis of symmetry, reflective symmetry	In addition to all previous vocabulary... circumference, concentric, arc net, open, closed intersecting, intersection plane

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	symmetrical pattern, repeating pattern match						
2D shape	corner, side rectangle (including square) circle triangle	In addition to all previous vocabulary ... point, pointed	In addition to all previous vocabulary ... rectangular circular triangular pentagon hexagon octagon	In addition to all previous vocabulary ... pentagonal hexagonal octagonal quadrilateral right-angled parallel, perpendicular	In addition to all previous vocabulary ... 2-D, two-dimensional oblong rectilinear equilateral triangle, isosceles triangle, scalene triangle heptagon parallelogram, rhombus, trapezium polygon	In addition to all previous vocabulary ... x-axis, y-axis, quadrant	In addition to all previous vocabulary ... kite
3D shape	face, edge, vertex, vertices cube pyramid sphere cone	In addition to all previous vocabulary ... cuboid cylinder	Consolidate previously taught	In addition to all previous vocabulary ... hemisphere prism triangular prism	In addition to all previous vocabulary ... 3-D, three-dimensional spherical cylindrical tetrahedron, polyhedron	In addition to all previous vocabulary ... octahedron	In addition to all previous vocabulary ... dodecahedron net, open, closed
Position and direction	position over, under above, below top, bottom, side on, in outside, inside around	In addition to all previous vocabulary ... underneath center journey whole turn, half turn, quarter turn, three- quarter turn	In addition to all previous vocabulary ... route higher, lower clockwise, anticlockwise right angle straight line	In addition to all previous vocabulary ... compass point north, south, east, west, N, S, E, W horizontal, vertical, diagonal angle ... is a	In addition to all previous vocabulary ... north-east, north-west, south-east, south-west, NE, NW, SE, SW translate, translation rotate, rotation degree	In addition to all previous vocabulary ... coordinate protractor	In addition to all previous vocabulary ... reflex angle

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	in front, behind front, back beside, next to opposite apart between middle, edge corner direction left, right up, down forwards, backwards, sideways across next to, close, near, far along through to, from, towards, away from movement slide roll turn stretch, bend whole turn, half turn			greater/smaller angle than acute angle obtuse angle	reflection ruler, set square angle measurer, compass		
Statistics	count, sort group, set	In addition to all previous vocabulary...	In addition to all previous vocabulary...	In addition to all previous vocabulary...	In addition to all previous vocabulary...	In addition to all previous vocabulary...	In addition to all previous vocabulary...

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	list	vote table	tally graph, block graph, pictogram represent label, title most popular, most common least popular, least common	chart, bar chart, frequency table Carroll diagram, Venn diagram axis, axes diagram	survey, questionnaire, data	database bar line chart line graph maximum/ minimum value outcome	pie chart mean (mode, median, range as estimates for this) statistics, distribution
General	pattern puzzle what could we try next? how did you work it out? recognise describe draw compare sort	In addition to all previous vocabulary... problem, problem solving mental, mentally explain your thinking	In addition to all previous vocabulary... show how you... explain your method describe the pattern describe the rule investigate mental calculation written calculation	In addition to all previous vocabulary... greatest value, least value statement	In addition to all previous vocabulary... justify make a statement	In addition to all previous vocabulary... explain your reasoning	Consolidate previously taught