GRIMSDYKE SCHOOL


# Grimsdyke School Written Calculations Policy 

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| :--- | :--- | :--- |
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## Rationale

This policy contains the key pencil and paper procedures that will be taught within our school. It has been written to ensure consistency and progression throughout the school and reflects a whole school agreement. The calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in written calculations across the school. Please note that early learning in number and calculation in Reception follows the 'Development Matters' EYFS document, and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

## Teaching and Learning

This calculation policy should be used to support children to develop a deep understanding of number and calculation. At Grimsdyke School, we use 'White Rose' as a format as a basis for our planning and use the philosophy of: fluency, reasoning and problem solving. White Rose also follows the Concrete - Pictorial - Abstract approach to teaching maths. This policy has been designed to teach children through the use of concrete, pictorial and abstract representations. It is important that conceptual understanding, supported by the use of representation, is secure for all procedures. Reinforcement is achieved by going back and forth between these representations.

- Concrete representation - a pupil is first introduced to an idea or skill by acting it out with real objects. This is a 'hands on' component using real objects and is a foundation for conceptual understanding.
- Pictorial representation - a pupil has sufficiently understood the 'hands on' experiences performed and can now relate them to representations, such as a diagram or picture of the problem. This helps children make the connection between the physical object and abstract levels of understanding, which is the stage they move onto next.
- Abstract representation - The abstract stage brings in mathematical symbols, for example +, $-, x, \div$ to indicate addition, subtraction, multiplication and division. This is used when a pupil is secure in their understanding of representing problems by using mathematical notation, for example $12 \times 2=24$.


## Planning, Progression and Continuity

The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, however it is vital that pupils are taught according to the year group that they are currently working at and then given 'mastery' opportunities within their age-related expectations in order to fully embed the concepts learned. Furthermore, if a teacher feels a child is ready to move onto the next stage of a calculation which is in the next year group's expectations, then this should be facilitated.

At the centre of the mastery approach to the teaching of mathematics is the belief that all children have the potential to succeed. They should have access to the same curriculum content and, rather than being extended with new learning, they should deepen their conceptual understanding by tackling challenging and varied problems. Similarly, with calculation strategies, children must not simply rote learn procedures but demonstrate their understanding of these procedures through
the use of concrete materials and pictorial representations. This policy outlines the different calculation strategies that should be taught and used in Year 1 to Year 6 in line with the requirements of the 2014 Primary National Curriculum. Each operation is broken down into skills for the year group and shows recommended models and visuals to support the teaching of the corresponding concepts alongside.
'Real things and structured images enables children to understand the abstract. The concrete and the images are a means for children to understand the symbolic so it's important to move between all modes to allow children to make connections'. (Morgan, D. 2016)

## Addition

EYFS

| Objectives |
| :--- |


| Addition involves putting |
| :--- |
| groups together or |
| counting on |
| To know the number |
| bonds up to 10 |

Say which number is one
more than a given number
physically manipulate.
for numbers to 20 .

## Year 1

Objectives

- To know that equals means the same as
- To know that a number bonds join numbers together to make another number
- To know the number bonds up to 20
- To know that addition is finding the total of two or more numbers or objects
- To know the mathematical symbols for addition (+)
- To know that adding a zero has no effect on the answer
- To know different terminology for addition such as put together, add, altogether, total, more than
- To identify and say one more than a given number
- To add one-digit and twodigit numbers to 20 , including zero
- To read, write and interpret mathematical statements involving addition

Concrete
Use cubes to add two numbers together as a group or in a bar.


Use part-part whole model


Adding 1 with string beads


Pictorial
Part whole model


Number bonds to 10
OOQOQOQ00Q

Adding together

## Abstract

Notation for addition


Number bonds to 20



There are 5 leaves altogether.


- To solve one-step problems that involve addition using concrete objects and pictorial representations


## Vocabulary

- Add
- More
- Plus
- Make
- Altogether
- Total
- Equal to
- Equals
- Count on
- Number line
- Balancing
- Part part whole


Finding number bonds to 20


Addition with bar models
18


## Year 2

- To know and recall addition facts to 20 fluently
- To know that addition of two numbers can be done in any order (commutative)
- To know that there is a relationship between addition and we call this the inverse
- To use addition facts to 20 to derive related facts up to 100
- To add and subtract numbers using concrete objects, pictorial representations, and mentally, including:
* a two-digit number and ones
* a two-digit number and tens
* two two-digit numbers
* adding three one-digit numbers
- To show that addition of two numbers can be done in any order


2021222324252627282930

## Abstract

Using addition facts to derive related facts up to 100


Addition using number bonds


Addition by partitioning

```
49+23}\{\begin{array}{l}{40+9}\\{20+3}\\{60+12=72}
```

Record addition in columns


- To solve problems with addition and subtraction using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- To apply their increasing knowledge of mental and written methods
- To record addition in columns


## Vocabulary

- Add
- More
- Plus
- Make
- Altogether
- Total
- Equal to
- Equals
- Count on
- Number line
- Sum
- Partition
- Addition
- Column
- Partition

Adding across ten


Year 3

## Objectives

- To know the formal written methods of columnar addition.
- To solve number problems and practical problems involving place value
- To add numbers mentally, including:
- a three-digit number and ones
- a three-digit number and tens
- a three-digit number and hundreds

Vocabulary

- Addition
- Add
- More
- Make
- Sum
- Total
- Altogether
- Regrouping
- Exchanging

Pictorial
Place value chart addition with counters


Year 4

## Objectives

- To find 1000 more than a given number
- To add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate
- To estimate and use inverse operations to check answers to a calculation
- To solve addition two-step problems in contexts
- To add fractions with the same denominator


## Vocabulary

- Addition
- Add
- More
- Make
- Sum
- Total
- Altogether
- Regrouping
- Exchanging
- Decimal point

Concrete
Place value chart with counters for addition


Including decimal addition


Year 5

## Objectives

- To count forwards with positive and negative whole numbers, including through zero
- To add numbers mentally with increasingly large numbers
- To add whole numbers with more than 4 digits, including using formal written methods
(columnar addition and subtraction)
- To add fractions with the same denominator and multiples of the same number
- To use all four operations to solve problems involving measure (e.g. length, mass, volume, money) using decimal notation including scaling.

Vocabulary

## Concrete

Pictorial
Large numbers addition with exchanging


Adding decimals with the same number of decimal places

$+$

Abstract
Adding larger numbers


Adding decimals


Adding fractions with the same denominator


- Addition
- Add
- More
- Make
- Sum
- Total
- Altogether
- Regrouping
- Exchanging
- Decimal point

Adding decimals with a different number
of decimal places

$$
2.5+3.16=
$$

| Ones | tenths | hundredths |
| :---: | :---: | :---: |
|  |  |  |
|  |  |  |
|  |  |  |
| 5 | 6 | 6 | 4. RESPECIIN unicef (3) suvera -achis mamat



- Total
- Altogether
- Regrouping
- Exchanging
- Decimal point
- BODMAS


## Subtraction

## EYFS

## Objectives

- Subtraction involves removing items from a group or counting back
- To know the number bonds up to 10
- Can count on or back to find the answer when adding or subtracting.
- They can solve subtraction problems for numbers to 20 using practical apparatus.


## Vocabulary

- Number
- Less
- Take away


## Concrete

Use toys and general classroom resources for children to physically manipulate.


Use specific maths resources such as counters, connecting cubes, Numicon etc.


## Year 1

## Objectives

- To know that subtraction means taking away to find how many are left.
- To know the mathematical symbols for subtraction (-) and equals (=) signs
- To know that subtracting a zero has no effect on the answer
- To know different terminology for subtractions such as take away, distance between, difference between and less than
- To use number bonds and related subtraction facts within 20
- To subtract one-digit and two-digit numbers to 20, including zero
- To read, write and interpret mathematical statements involving the subtraction (-) and equals (=) signs
- To solve one-step problems that involve subtraction, using concrete objects and pictorial

Concrete
Part whole model


Tens frame


Pictorial
Subtraction by crossing out - how many left?


First there were 9 cupcakes. Then Chase ate 2 cupcakes. Now there are 7 cupcakes.


Subtraction by counting back How many more to make 10? (link with addition)


Finding the difference


## Abstract

Subtract 1-digit numbers

representations, and missing number problems
such as $7=\square-9$

## Vocabulary

- Subtraction
- Take away
- Difference between
- Less
- Less than
- Fewer
- Fewer than
- Minus


## Year 2

Objectives

- To know and recall addition subtraction facts to 20 fluently
- To know that subtraction is not commutative
- To know that there is a relationship between subtraction and we call this the inverse
- To know that when we subtract using columns, the place value of digits need to be lined up
- To use subtraction facts to 20 to derive related facts up to 100
- To subtract numbers using concrete To show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
- To use the inverse relationship between addition and subtraction to check calculations and solve missing number problems.
- To solve problems with addition and subtraction


## Concrete

Subtracting cubes

using concrete objects and pictorial representations, including those involving numbers, quantities and measures

- To apply their increasing knowledge of mental and written methods
- To record subtraction in columns


## Vocabulary

- Subtraction
- Take away
- Difference between
- Less
- Less than
- Fewer
- Fewer than
- Minus
- Count backwards

Partitioning for subtraction


Using a number line


Year 3

## Objectives

- To know the formal written methods of columnar subtraction
- To subtract numbers mentally, including:
- a three-digit number and ones
- a three-digit number and tens
- a three-digit number and hundreds
- To subtract numbers with up to three digits, using formal written methods of columnar subtraction


## Vocabulary

- Hundreds
- Thousands
- Less
- Less than
- Fewer
- Fewer than
- Take away
- Subtract
- Column
- Count on
- Partition


## Concrete

Using base 10 resources in formal column method


Abstract
Subtraction with partitioning


Formal standard written method


Formal written method with exchanging


## Year 4

## Objectives

- To find 1000 more or less than a given number
- To count backwards through zero to include negative numbers
- To subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate
- To estimate and use inverse operations to check answers to a calculation
- To solve subtraction twostep problems in contexts, deciding which operations and methods to use and why
- To subtract fractions with the same denominator

Vocabulary

- Less than
- Fewer than
- Subtract
- Column
- Count on
- Partition
- Exchanging
- Decimal


## Concrete

Place value chart with counters for subtraction


Pictorial
Subtracting with exchangin


Counting on or counting back


Subtracting negative numbers


## Abstract

Formal written method


Subtraction with decimals - money


Subtracting fractions with the same denominator


## Year 5

Objectives

- To count backwards with positive and negative whole numbers, including through zero
- To subtract numbers mentally with increasingly large numbers
- To subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction)
- To use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
- To solve subtraction multistep problems in contexts, deciding which operations and methods to use and why
- To subtract fractions with the same denominator and multiples of the same number


## Vocabulary

- Hundreds
- Thousands

Concrete


Visualising subtraction


Subtracting decimals with the same number of decimal places.
$3.51-1.36=2.15$


Abstract
Subtracting larger numbers


Subtracting decimals


Subtracting fractions with the same denominator


- Less
- Less than
- Fewer
- Fewer than
- Take away
- Subtract
- Column
- Count on
- Partition
- Exchanging
- Decimal

Subtracting decimals with a different number of decimal places.
$7.2-2.27=4.93$


| Ones | tenths | hundredths |
| :---: | :---: | :---: |
|  |  |  |
| 4 |  | 9 |

## Objectives

- To subtract numbers mentally with increasingly large numbers
- To subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction)
- To use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
- To solve subtraction multistep problems in contexts, deciding which operations and methods to use and why
- To subtract fractions with the same denominator and multiples of the same number
- To know the order of operations (BODMAS) to carry out calculations involving the four operations
- To perform mental calculations, including with mixed operations and large numbers

Concrete


Subtracting large numbers with exchanging


Bar model subtractions


Finding the difference


Abstract
Subtracting larger numbers


Subtracting fractions where one denominator is a factor of the other


## BODMAS


$8-3 \times 2=2$

- To use their knowledge of the order of operations to carry out calculations involving the four operations
- To use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy
- To solve subtraction multistep problems in contexts
- To subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions


## Vocabulary

- Less
- Less than
- Fewer
- Fewer than
- Take away
- Subtract
- Column
- Count on
- Partition
- Exchanging
- Decimal
- BODMAS


## Multiplication

EYFS
Objectives Concrete

- Doubling involves combining two equal groups
- They can double numbers to 10.
- Can solve simple problems using apparatus that involve doubling

Vocabulary

- Double
- Groups


Doubling with fingers


Use toys and general classroom resources for children to physically manipulate.


Use specific maths resources such as counters, connecting cubes, Numicon etc.


Pictorial
Doubling


## Year 1

## Objectives

- To know that even numbers are numbers ending in $2,4,6,8$ and 0
- To know that odd numbers are numbers ending in 1,3,5,7 and 9
- To know the twos, fives and ten times tables
- To know that multiplication is repeated addition
- To count in multiples of twos, fives and tens
- To solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher Vocabulary
- Even
- Odd
- Twos, Fives, Tens
- Times
- Multiply
- Groups of
- Lots of
- Array

Concrete
Counting in multiples


Repeated addition


Pictorial
Counting in 10s

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 0 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 0 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 0 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 8 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | - |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |  |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 0 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |  |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 0 |



Using arrays


Abstract
Repeated addition

```
2+2+2=6
```


## Counting in twos



## Year 2

## Objectives

- To recall multiplication facts for the two, five and ten multiplication tables, including recognising odd and even numbers
- To know that multiplication of two numbers can be done in any order (commutative)
- To know the multiplication (x)
- To know that an array is an arrangement of objects, numbers or pictures in equal columns or rows
- To know that multiplication are the inverse of each other (for example, $4 \times 5=20$ and 20 $\div 5=4$ )
- To use multiplication facts for the 2, 5 and 10 multiplication tables
- To show that multiplication of two numbers can be done in any order (commutative)
- To calculate mathematical statements for multiplication within the multiplication tables and


Counters to show that multiplication is commutative



Counting in groups


Arrays


Multiplying by 2


Multiplying by 5


Abstract
Repeated addition

```
5+5+5=15
3+3+3+3+3=15
5\times3=15
```

write them using the
multiplication ( $\times$ ),

- and equals (=) signs
- To solve problems
involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts
- To connect the 5 multiplication table to the divisions on the clock face
- To relate multiplication to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition


## Vocabulary

- Lots of
- Groups of
- Times
- Multiply
- Multiplied by multiple of
- Repeated addition
- Array
- Row
- Column
- Commutative

Multiplying by 10 - repeated addition

| 30 |  |  |
| :--- | :--- | :--- |
| 10 | 10 | 10 |

Year 3

## Objectives

- To recall multiplication facts for the 3, 4 and 8 multiplication tables
- To know the formal written method for multiplication
- To use multiplication facts for the 3, 4 and 8 multiplication tables
- To 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
- To solve problems, including missing number problems, involving multiplication


## Vocabulary

- Multiply
- Repeated addition
- Product
- Equation
- Inverse
- Commutative


## Concrete

Place value counters


Pictorial
Arrays


Place value chart to support formal written method
$3 \times 31$


Multiplication with partitioning


## Abstract

Partitioning

$$
4 \times 24 \begin{gathered}
4 \times 24=96 \\
20 \\
4 \times 20=80 \\
4 \times 4=16
\end{gathered}
$$

unicef(3)

Year 4

## Objectives

- To recall multiplication facts for multiplication tables up to $12 \times 12$ including the six, seven and nine times tables
- To know that commutativity is when 2 numbers can be added or multiplied \& the same answer will be found no matter what order they are in
- To know the formal written method for multiplication
- To know that when you multiply by zero, the answer is zero
- To know that multiplying a number by a group of numbers is the same as doing each multiplication separately (distributed law)
- To use place value, known and derived facts to multiply and divide mentally, including multiplying by 0 and 1; dividing by 1; multiplying together three numbers


## Concrete

Multiplication square

| $\times$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 2 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| 3 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 33 | 36 |
| 4 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 44 | 48 |
| 5 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| 6 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 |
| 7 | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 79 | 77 | 84 |
| 8 | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 |
| 9 | 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 80 | 99 | 108 |
| 10 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 |
| 11 | 11 | 22 | 33 | 44 | 55 | 66 | 77 | 88 | 99 | 110 | 121 | 132 |
| 12 | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 | 132 | 144 |

Pictorial
Getting ten times bigger


B

Multiplying by 10


Abstract
Expanded written method


Formal written method


Multiplying by 10


- To use factor pairs and commutativity in mental calculations
- To multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- To estimate and use inverse operations to check answers to a calculation
- Use mental methods and extend this to three-digit numbers to derive facts, (for example $600 \div 3=200$ can be derived from $2 \times 3=$ 6
- To use knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, $2 \times 6 \times 5=10$ $x 6=60$


## Vocabulary

- Groups of
- Lots of
- Factor
- Multiple
- Distributive
- Repeated addition
- Array


## Multiplying by 100


$13 \times 100=$


Multiplying 3-digits by 1-digit
$123 \times 4=$
$123 \times 4=492$

| Hundreds | Tens | Ones |
| :---: | :---: | :---: |
| - | $\odot$ | 0 |
| - | 0 | 0 |
| - | 0 | 0 |
| - | $\odot$ | 0 |

## Multiplying by 100

$15 \times 100=1500$

Th HTO

1500

## Year 5

## Objectives

- To count forwards in steps of powers of 10 for any given number up to 1000 000
- To know the formal written method of long multiplication
- To know that factors are numbers that divide exactly into another number.
- To know that a multiple is the product result of one number multiplied by another number.
- To know that prime numbers are numbers which only have two factors
- To recall prime numbers up to 19
- To know that squaring a number means multiplying it by itself and it is notated as ( ${ }^{2}$ )
- To know that cubing a number is multiplying it by itself three times it is notated as ( ${ }^{3}$ )


## Concrete

100 square with counters to find prime numbers


## Pictorial

Multiplying by 10, 100 \& 1000

| Th | H | T | O |
| :---: | :---: | :---: | :---: |
|  |  | 7 | 8 |
| Th | H | T | O |
|  | 7 | 8 | 0 |


| Th | H | T | O |
| :---: | :---: | :---: | :---: |
| 7 | 8 | 0 | 0 |


| TTh | Th | H | T | O |
| :---: | :---: | :---: | :---: | :---: |
| 7 | 8 | 0 | 0 | 0 |

Multiplying 2-digits by 2-digits

$$
23 \times 31
$$

| $\times$ | 20 | 3 |
| :---: | :---: | :---: |
| 30 | 600 | 90 |
| 1 | 20 | 3 |

$$
600+90+20+3=713
$$

Abstract
Multiplying 2-digits by 2-digits


Square numbers


Cube numbers


- To multiply numbers mentally drawing upon known facts
- To multiply whole numbers and those involving decimals by 10, 100 and 1000
- To multiply numbers up to 4 digits by a one- or twodigit number using a formal written method, including long multiplication for two-digit numbers
- To identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.
- To establish whether a number up to 100 is prime and
- To work out square numbers and cube numbers
- To solve problems involving multiplication including using their knowledge of factors and multiples, squares and cubes
- To solve problems involving multiplication

Multiplying 4-digits by 2-digits
$2,313 \times 32=$

| $x$ | 2,000 | 300 | 10 | 3 |
| :---: | :---: | :---: | :---: | :---: |
| 30 | 60,000 | 9,000 | 300 | 90 |
| 2 | 4,000 | 600 | 20 | 6 |

$60,000+9,000+4,000+600+300+90+20+6=$

Multiplying fractions with whole numbers


Answer: $2 \frac{2}{5}$
including scaling by simple
fractions and problems involving simple rates

- To multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams


## Vocabulary

- Factor
- Multiple
- Square number
- Prime number
- Repeated addition
- Inverse
- Factor pairs
- Composite numbers
- Prime number
- Squared
- Cubed


## Year 6

Objectives

- To know the order of operations (BODMAS) to carry out calculations involving the four operations
- To know that orders show how many times a number or letter has been multiplied by itself
- To perform mental calculations, including with mixed operations and large numbers
- To explore the order of operations using brackets
- To multiply and divide numbers mentally drawing upon known facts
- To multiply and divide whole numbers and those involving decimals by 10 , 100 and 1000
- To multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- To identify common factors, common multiples and prime numbers


## Concrete

Multilink cubes to investigate square numbers:


Multilink cubes to investigate cube numbers


Multiplying two digits by two digits.

$$
13 \times 13=
$$



Abstract
Formal written method for multiplying decimals


Multiplication square


- To use their knowledge of the order of operations to carry out calculations involving the four operations
- To use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy
- To multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. ${ }^{1} / x^{1}{ }^{1} / 2=1 /$ )
- To multiply one-digit numbers with up to two decimal places by whole numbers
- To multiply one-digit numbers with up to two decimal places by whole numbers
- To multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places
- To multiply and divide numbers with up to two decimal places by one-digit and two-digit whole numbers

Multiplying by 10,100 and 1000.

| 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| 1 | 2 | 3 | $\times 100$ | 5 | 6 | 7 | 8 | 9 |
| 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |

$3.12 \times 10=$


- To multiply decimals by whole numbers, starting with the simplest cases, such as $0.4 \times 2=0.8$, and in practical contexts, such as measures and money


## Vocabulary

- Factor
- Multiple
- Square number
- Prime number
- Repeated addition
- Inverse
- Factor pairs
- Composite numbers
- Prime number
- Squared
- Cubed
- Prime factor
- Discount
- Profit
- BODMAS


## Division



## Year 1

## Objectives

- To know that division is breaking a number up into equal parts, and finding out how many equal parts can be made
- To know different terminology for division such as sharing, grouping
- To know that a half is one of two equal parts of an object, shape or quantity
- To know that a quarter is one of four equal parts of an object, shape or quantity
- To know that a fractions is splitting a whole (number/shape etc) into parts
- To solve one-step problems involving division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher
- To find and name quarter of an object, shape or quantity

Concrete
Share into equal groups


Pictorial
Making equal groups


Sharing


9 apples shared equally between 3 horses is $\square$

## Abstract

## Notation for division



- To find half a length, quantity, set of objects or shape


## Vocabulary

- Groups
- Share
- Equal
- Half
- Quarter
- Array



## using the multiplication

$(x)$, division $(\div)$ and equals (=) signs

- To solve problems involving division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts
- To relate division to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition

Vocabulary

- Share
- Share equally
- Group
- Groups of
- Lots of
- Array
- Divide
- Divided by
- Divided into
- Division
- Grouping
- Left
- Left over

Dividing by 2


Dividing by 5
Here are 15 conkers.

The conkers are shared into 5 equal groups.


Dividing by 10


## Year 3

## Objectives

- To know that tenths arise from dividing an object into 10 equal parts and in dividing one - digit numbers or quantities by 10.
- To use division facts for the 3,4 and 8 multiplication tables
- To write and calculate mathematical statements for 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
- To solve problems, including missing number problems, involving division


## Vocabulary

- Remainder
- Equation
- Share
- Share equally
- Group
- Groups of
- Lots of

Concrete
Arrays


Diving with remainders
$14 \div 3=4 \mathrm{r} 2$


## Pictorial

Different ways of dividing by $3 / 4 / 8$ etc


Dividing by counting up or back


Dividing 2-digits by 1 -digit
$51 \div 3$


## Abstract

Dividing with partitioning


Dividing with remainders

## $29 \div 8=3$ remainder 5

- Array
- Divide
- Divided by
- Divided into
- Left
- Left over


## Objectives <br> - To recall division facts for

 multiplication tables up to $12 \times 12$ including the six, seven and nine times tables- To know that when you divide by 1 , the answer is the same
- To know the formal written method of division
- To know that hundredths arise when dividing an object by one hundred and dividing tenths by ten
- To use place value, known and derived facts to multiply and divide mentally, including multiplying by 0 and 1 ; dividing by 1; multiplying together three numbers


## Vocabulary

- Quotient
- Divisor
- Dividend
- Divisible by
- Inverse
- Remainder
- Equation

Concrete

| Pictorial |  |  |  |
| :--- | :---: | :---: | :---: |
| Dividing by 10 |  |  |  |
| Th |  |  |  |
| $\mathbf{T h}$ |  |  |  |

$430 \div 10=$

$430 \div 10=4$

Diving by 100

$4,100 \div 100=$


Abstract
Formal written method with remainders


Dividing by 10


Dividing by 100


- Share
- Share equally
- Group
- Groups of
- Lots of
- Array
- Divide
- Divided by
- Divided into
- Left
- Left over


## Diving 3-digits by 2-digits


$609 \div 3=203$


## Year 5

## Objectives

- To know the formal written method of division
- To know that factors are numbers that divide exactly into another number.
- To recall prime numbers up to 19
- To multiply and divide numbers mentally drawing upon known facts
- To multiply and divide whole numbers and those involving decimals by 10 , 100 and 1000
- To 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
- To identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.
- To establish whether a number up to 100 is prime
- To solve problems involving division including


## Concrete

Pictorial
Dividing by 10, 100 \& 1000


Dividing 4-digits by 1-digit
$9306 \div 3$


## Abstract

Short division with remainders

using their knowledge of
factors and multiples,
squares and cubes

- To solve problems involving division, including scaling by simple fractions and problems involving simple rates
- To 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


## Vocabulary

- Quotient
- Divisor
- Dividend
- Divisible by
- Inverse
- Remainder
- Equation
- Share
- Share equally
- Group
- Groups of
- Lots of
- Array
- Divide
- Divided by
- Divided into
- Left
- Left over


## Year 6

## Objectives

- To know the order of operations (BODMAS) to carry out calculations involving the four operations
- To know that fractions are a result of division
- To explore the order of operations using brackets
- To multiply and divide numbers mentally drawing upon known facts
- To multiply and divide whole numbers and those involving decimals by 10 , 100 and 1000
- To divide numbers up to 4digits by a two-digit whole number using the formal written method of short division where appropriate for the context divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division
- To interpret remainders as whole number remainders, fractions, or by rounding,

Concrete

Dividing a 4-digit number by 1-digit number


With remainders


## Pictorial

Abstract
Long division



as appropriate for the context

- To use written division methods in cases where the answer has up to two decimal places
- To identify common factors, common multiples and prime numbers
- To use their knowledge of the order of operations to carry out calculations involving the four operations
- To use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy


## Vocabulary

- Quotient
- Divisor
- Dividend
- Divisible by
- Inverse
- Remainder
- Equation
- Share
- Share equally
- Group
- Groups of


## Finding factors



1 and 30
$30 \longrightarrow 5$ and 6
2 and 15
3 and 10

- Lots of
- Array
- Divide
- Divided by
- Divided into
- Left
- Left over
- BODMAS

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