





Grimsdyke School Written Calculations Policy

Approved by:	Governing Body	Date: 06.05.22
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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, ÷ 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 x 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 for numbers to 20.
- They can solve addition problems for numbers to 20 using practical apparatus.

Vocabulary

- Number
- More
- Less
- Add
- More
- Make
- Sum
- Total
- Altogether





Concrete Use toys and general classroom resources for children to

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



Use visual supports such as ten frames, part part whole and addition mats, with the physical objects and manipulatives.





How many have been added?







- To know that equals ٠ means the same as
- To know that a number ٠ bonds join numbers together to make another number

Objectives

- To know the number ٠ bonds up to 20
- To know that addition is ٠ finding the total of two or more numbers or objects
- To know the mathematical ٠ symbols for addition (+)
- To know that adding a ٠ zero has no effect on the answer
- To know different ٠ terminology for addition such as put together, add, altogether, total, more than
- To identify and say one ٠ more than a given number
- To add one-digit and two-٠ digit numbers to 20, including zero
- To read, write and ٠ interpret mathematical statements involving addition

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

Concrete



Use part-part whole model



Adding 1 with string beads







Adding together



There are <u>5</u> leaves altogether.



Abstract Notation for addition



Number bonds to 20







• 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







Addition with base 10



First				Then					
				,		-			
				1					

Finding number bonds to 20



Addition with bar models



6





- 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

Concrete Using multilink cubes



Using number bonds to make 10 and then add on.







Adding two, 1-digit numbers



12

1

13

11

+2

20 21 22 23 24 25 26 27 28 29 30

4

Adding on a number line

Pictorial



Addition using number bonds



Abstract

Addition by partitioning

4	9	+	2	3				
42	00	+ +	93					
6	0	+	1	2	()	7	2	

Record addition in columns

2	4
1	5
2	9
	212



- 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







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

Place value chart addition with counters

Concrete



additi	on			
	Н	Т	0	
	6 6 6	2 2 2		
+				

Bar model

Pictorial

Partitioning numbers to complete

Abstract Adding by partitioning 1 4 6 + 5 7 1 1 0 + 4 0 1

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= 673

Formal written method

600 + 70 + 3



With exchanging





Using diene representations and number

900

200

900 - 200 = 700

900 - 700 = 200

700 = 900 - 200

200 = 900 - 700

700

700 + 200 = 900

200 + 700 = 900

900 = 700 + 200

900 = 200 + 700





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 Adding wi



Including decimal addition





Pictorial



Adding negative numbers





Abstract

Adding decimals – money



Adding negative numbers



Adding fractions with the same denominator







Year 5			
Objectives	Concrete	Pictorial	Abstract
 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. 	Concrete	Pictorial Large numbers addition with exchanging Image: I	Abstract Adding larger numbers Adding decimals Adding decimals Adding fractions with the same denominator





	A !			· ·			
Addition	Adding	decimais	s with a di	fferent nu	mber		
Add	of decir	nal place	S				
More		2.5 + 3	3.16 =				
• Make							
		Ones	tenths	hundredths			
					1		
• Allogether							
Regrouping					1		
• Exchanging							
Decimal point							
		5	• 6	6			
	+						





Year 6			
Objectives	Concrete	Pictorial	Abstract
 To perform mental calculations, including with mixed operations and large 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 To solve addition multistep problems in contexts To explore the order of operations with different denominators and mixed numbers, using the concept of equivalent fractions 		Bar model ? 346,221 184,321 Adding large numbers TTh Th H T 0 0 0	Adding larger numbers 462581 +79362 541943 Adding fractions where one denominator is a factor of the other 542 542 542 542 542 542 542 542
Vocabulary		$\overbrace{\bullet}^{\smile} \overbrace{\bullet}^{\smile} \overbrace{\bullet}^{\smile} \overbrace{\bullet}^{\bigcirc} \overbrace{\bullet}^{\bigcirc} \overbrace{\bullet}^{\frown}$	$6 \times (5 + 1) = 36$
 Addition Add More Make Sum 			





 Altogether Regrouping Exchanging Decimal point BODMAS 	• Total		
 Regrouping Exchanging Decimal point BODMAS 	Altogether		
 Exchanging Decimal point BODMAS 	Regrouping		
 Decimal point BODMAS 	• Exchanging		
• BODMAS	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



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



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



Subtracting



Pictorial





• To know that subtraction means taking away to find how many are left.

Objectives

- 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







Pictorial

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





representations, and missing number problems such as $7 = \Box - 9$ Vocabulary • Subtraction Take away ٠ Difference between ٠ Less ٠ Less than ٠ Fewer ٠ Fewer than ٠ Minus ٠





- 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





Subtracting across tens





Subtracting a two digit number from a two digit number Part-whole model



S	ubt	ract	tion	by	par	titio	onir	ng		
		4	7	-	2	4				
		4	0	+	7					
	-	2	0	+	4					
		2	0	+	3		1	2	3	

Abstract





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





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



Pictorial

Part-whole models



Place value chart for subtraction

Hundreds	Tens	Ones
		• • • • • • • •



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Formal standard written method



Formal written method with exchanging







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



Subtracting with exchanging Th H T O

Pictorial





Counting on or counting back





Subtracting negative numbers

Formal written method



Subtraction with decimals - money

Abstract



Subtracting fractions with the same denominator









Year 5			
Objectives	Concrete	Pictorial	Abstract
• To count backwards with		Subtraction with exchanging	Subtracting larger numbers
positive and negative		TTh Th H TTh Th H T O	
whole numbers, including			0 14 9 1
through zero			1 50699
 To subtract numbers 			- 89 01.9
mentally with increasingly			01,94,9
large numbers		ØØ <u>Ø</u> Ø	60,150
To subtract whole		200 200 200 200 200 200 200 200 200 200	
numbers with more than 4			Culture ating all size all
digits, including using			Subtracting decimals
formal written methods		Visualicing subtraction	3
(columnar subtraction)		visualishing subtraction	XXXXIA
 To use rounding to check answers to calculations 		?	123419
and determine in the		10,921	- 561080
context of a problem		40.075	69.339
levels of accuracy		40,075	
 To solve subtraction multi- 			Subtracting fractions with the sa
step problems in contexts.		Subtracting decimals with the same	denominator
deciding which operations		number of decimal places.	
and methods to use and		3.51 - 1.36 = 2.15	1-4-3
why			8 8 8
• To subtract fractions with			
the same denominator and		Ones tenths hundredths	
multiples of the same			
number			
Vocabulary			
Hundreds			
 Thousands 			





- 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	3





OpticitiesConcretForoidAbracit9. sobtracts when supervisesPartwale modelStart when supervisesStart when superv	Year 6			
 a subtract members minor loss minor	Objectives	Concrete	Pictorial	Abstract
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mixed operations and large numbers Adults 11,063 24	calculations, including	with	Children 3,301	
large numbers 24	mixed operations and		Adulta 11.0C2	
24	large numbers		Addits 11,065	
24				
				24





To use their knowledge of • Finding missing numbers the order of operations to carry out calculations involving the four operations To use estimation to check ٠ 9 tens 3 tens answers to calculations and determine, in the Number line for subtraction context of a problem, levels of accuracy To solve subtraction multi-٠ 2,284 35,000 step problems in contexts - 1 • To subtract fractions with different denominators 2,283 34,999 and mixed numbers, using the concept of equivalent fractions Vocabulary • Less Less than • Fewer ٠ Fewer than ٠ Take away • Subtract • Column • Count on • Partition • Exchanging ٠ Decimal • BODMAS ٠



•



Multiplication EYFS Objectives Pictorial Concrete Doubling Doubling involves Doubling one - eyes • combining two equal groups They can double numbers • to 10. Can solve simple problems • using apparatus that Doubling with fingers VO involve doubling Vocabulary Double Groups ٠ Use toys and general classroom resources for children to physically manipulate. Use specific maths resources such as counters, connecting cubes, Numicon etc.





To know that even ٠ numbers are numbers ending in 2,4,6,8 and 0

Objectives

- To know that odd ٠ numbers are numbers ending in 1,3,5,7 and 9
- To know the twos, fives ٠ and ten times tables
- To know that ٠ multiplication is repeated addition
- To count in multiples of ٠ twos, fives and tens
- To solve one-step ٠ problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

Vocabulary

- Even ٠
- Odd ٠
- Twos, Fives, Tens .
- Times ٠
- Multiply ٠
- Groups of •
- Lots of ٠
- Array ٠





Concrete

Repeated addition





Counting in 10s 3 4 5 6 8 13 14 15 16 11 12 17 18 19 21 22 23 24 25 26 27 28 29 31 32 33 34 35 36 37 38 39

91 92 93 94 95 96 97 98 99

0 10 20 30 40 50 60 70 80 90 100

Pictorial



Abstract

Counting in twos



Using arrays







- 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 (×)
- 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 × 5 = 20 and 20 ÷ 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

Concrete Counters for arrays



Counters to show that multiplication is commutative





Groups of



Pictorial







Multiplying by 5







write them using the multiplication (×),	Multiplying b	y 10 – repeate	ed addition
• and equals (=) signs		30	
To solve problems	10	10	10
involving multiplication,			
using materials, arrays,			
repeated addition, mental			
methoas, 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			
Vocabularv			
Lots of			
Groups of			
• Times			
Multiply			
Multiplied by multiple of			
Repeated addition			
• Array			
• Row			
Column			
Commutative			



Objectives

- To recall multiplication facts for the 3, 4 and 8 multiplication tables
- To know the formal ٠ written method for multiplication
- To use multiplication facts ٠ 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 ٠
- Repeated addition •
- Product •
- Equation ٠
- Inverse .
- Commutative •

Place value counters



Concrete

Arrays Class 1 Class 2



Pictorial

Class 3

Place value chart to support formal written method

 3×31

20

 $4 \times 20 = 80$ $4 \times 4 = 16$



 $4 \times 24 = 96$

There are 96 rolls in total.

Abstract Multiplication with partitioning

unicef 🙆 SILVER - RIGHTS AWAR







Objectives

- To recall multiplication facts for multiplication tables up to 12 × 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

×	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	4	6	8	10	12	14	16	18	20	22	24
	3	6	9	12	15	18	21	24	27	30	33	36
	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	14	21	28	35	42	49	56	63	70	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	90	99	108
10	10			40		60		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



10 times

the size

10 times

the size

 $24 \times 10 = 240$

 $24 \times 10 =$

н

10 times

the size

10 times

the size

0

т

10 times

the size

10 times

the size

Th



Expanded written method

Abstract

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 ÷ 3 = 200 can be derived from 2 x 3 = 6
- To use knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, 2 x 6 x 5 = 10 x 6 = 60

Vocabulary

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

Multiplying by 100





Multiplying 3-digits by 1-digit

123 × 4	=		123 × 4	492	
Hundreds	Tens	Ones	Hundreds	Tens	One
9	00	00	•	2	0
10	2	00	•	2	
	00		•	00	
•	00	00	•	00	
				\odot	

Multiplying by 100

							1393		12.5	
1	5	×	1	0	0	11	1	5	0	0
Th	H	T	0							
		1	5							
T	5	0	0							





Ye	ar 5							
	Objectives	Concrete		Pic	torial			Abstract
•	<i>To count forwards in steps of powers of 10 for any given number up to 1000</i>	100 square with counters to find prime numbers	Multiplying	by 10, 1	00 & 10	00		Multiplying 2-digits by 2-digits
•	To know the formal written method of long multiplication To know that factors are numbers that divide exactly into another number.	11 12 13 14 15 15 17 18 19 26 24 22 23 24 28 26 27 28 29 30 31 32 25 34 35 38 37 38 39 48 41 42 43 44 45 98 47 98 45 80 51 52 53 54 55 58 57 58 59 50 61 62 95 94 95 95 67 98 95 70 71 72 73 74 75 76 77 38 95 90 61 62 95 94 95 95 67 98 95 70 71 72 73 74 75 76 71 78 79 38 91 82 83 84 85 86 87 98 90 90		Th	н 7 Н	т 7 8 т	8 0 0	
•	To know that a multiple is the product result of one number multiplied by another number. To know that prime numbers are numbers	AT	TTh 7	7 Th 8	8 н О	0 T O	0 0 0	Square numbers $5^{2} = ?$ $5 \times 5 = 25$
•	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 $\binom{2}{}$ To know that cubing a		× 2 30 60		23 × 3 3 90	1		Cube numbers
	number is multiplying it by itself three times it is notated as (³)		600 + 90	+ 20 + 3	5 = 713			



- RIGHTS RESPECTING SCHOOLS UNTED KINGDOM SILVER-RIGHTS AWARE
- To multiply numbers Multiplying 4-digits by 2-digits Multiplying fractions with whole numbers ٠ mentally drawing upon 4 known facts 2,313 × 32 = 5 To multiply whole numbers ٠ 2,000 300 10 3 \times and those involving decimals by 10, 100 and 30 60,000 9,000 300 90 1000 5 To multiply numbers up to • 2 4,000 600 20 6 4 digits by a one- or two-Answer: 2 digit number using a 60,000 + 9,000 + 4,000 + 600 + 300 + 90 + 20 + 6 = formal written method, including long multiplication for two-digit numbers To identify multiples and ٠ factors, including finding all factor pairs of a number, and common factors of two numbers. To establish whether a ٠ number up to 100 is prime and To work out square • numbers and cube numbers To solve problems ٠ involving multiplication including using their knowledge of factors and multiples, squares and cubes To solve problems • involving multiplication





	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
	Sauare number
	Prime number
•	Popostod addition
•	
•	Inverse
•	Factor pairs
•	Composite numbers
•	Prime number
•	Squared
•	Cubed





 To know the order of operations (BODMAS) to carry out calculations involving the four operations

Objectives

- 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 cube numbers



F	Repeated	addition		
	Thousands	Hundreds	Tens	Ones
	1000	100	10 10	
	1000 1000	100	10 10	
	1000 1000	100	0 0	

Pictorial

Multiplying two digits by two digits.

	13 × 13 =	
×		

Abstract Formal written method for multiplying decimals



Multiplication square

1	×	E	1	0			3	
Wall was	10	60 F	1	0	0	0 5	30	
No No	25	3			200			
	3		3	0			9	
-	10		10 50			0		





- 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. $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$)
- 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







•	To multiply desimals by
•	
	whole numbers, starting
	with the simplest cases,
	such as 0.4 × 2 = 0.8, and
	in practical contexts, such
	as measures and money
	Vocabulary
٠	Factor
٠	Multiple
٠	Square number
٠	Prime number
•	Repeated addition
•	Inverse
•	Factor pairs
•	Composite numbers
-	Drimo number
•	
•	Squared
٠	Cubed
•	Prime factor
•	Discount
•	Profit
•	BODMAS





Division

EYFS		
Objectives	Concrete	Pictorial
 Halving involves splitting something into two equal groups or pieces Sharing mathematically involves being fair and giving an equal amount to each group They can halve numbers to 20. Can solve simple problems using apparatus that involve halving They can share out an amount in a fair, mathematical way. Vocabulary Half Share Fair 	Physical items halved Figure 2 and a state of the state	Sharing
		20





•	To know that division is
	breaking a number up into
	equal parts, and finding
	out how many equal parts
	can be made

Objectives

- 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
10
10

groups

Making equal groups



Pictorial



Sharing



Abstract

Notation for division







•	To find half a length,
	auantity. set of obiects or
	chano
	snape
	Vocabulary
•	Groups
•	Snare
•	Faual
-	
•	Half
•	Quarter
-	
•	Array





Yea	ar 2			
	Objectives	Concrete	Pictorial	Abstract
•	To recall and division facts		Sharing	Notation of division facts
	for the two, five and ten		666666	
	multiplication tables,			28-7=4
	including recognising odd			20.1- 4
	and even numbers			
•	To know that division is			
	not commutative			
•	To know that an array is			
	an arrangement of objects,			
	numbers or pictures in			
	equal columns or rows			
•	To know that division are			
	the inverse of each other			
	(for example, 4 × 5 = 20			
	and 20 ÷ 5 = 4)			
•	To know that a fractions is			
	splitting a whole			
	(number/shape etc.) into			
	parts			
•	To use division facts for		Crouping	
	the 2, 5 and 10		Grouping	
	multiplication tables			
•	To show that of two			
	numbers can be done in			
	any order (commutative)			
	by another cannot			
	To calculate mathematical			
•	statements for division			
	within the multiplication			
	tables and write them			





using the multiplication (×), division (÷) 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







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 ٠ the 3, 4 and 8 multiplication tables
- To write and calculate ٠ 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, ٠ including missing number problems, involving division

Vocabulary

- Remainder ٠
- Equation •
- Share •
- Share equally •
- Group ٠
- Groups of ٠
- Lots of •



Concrete

Diving with remainders $14 \div 3 = 4r2$







Dividing by counting up or back





Dividing 2-digits by 1-digit





Dividing with remainders

2	9	-	8	11	3	remainder 5







 Array Divide Divided by Divided into Left Left over 		





Year 4			
Objectives	Concrete	Pictorial	Abstract
 To recall division facts for multiplication tables up to 12 × 12 including the six 		Dividing by 10	Formal written method with remainders
seven and nine times tables			086~2
• To know that when you divide by 1, the answer is the same		$+10$ $+10$ $+10$ $+10$ $+10$ $+30 \div 10 =$	514 52
 To know the formal written method of division To know that hundredths 			Dividing by 10
arise when dividing an object by one hundred and dividing tenths by ten		+ 10 + 10 + 10	15-10=1.5
• To use place value, known and derived facts to		430 ÷ 10 = 4	HTOtoto
multiply and divide		Diving by 100	15.
multiplying by 0 and 1; dividing by 1: multiplying			1.5
together three numbers		+ 100 + 100	Dividing by 100
Vocabulary		4 4 00 + 4 00	
Quotient		4,100 - 100 -	15210050.15
• Divisor		Th H T O	
• Dividend			11 = 0 + +
• Divisible by			IT 1 0 TO 100
Inverse		+ 100 + 100	Ley 1
Remainder		$4.100 \div 100 = 41$	0,05
 Equation 		7,100 - 71	
			46











	Objectives	Concrete	Pictorial	Abstract
•	ObjectivesTo know the formalwritten method of divisionTo know that factors arenumbers that divideexactly into anothernumber.To recall prime numbersup to 19To multiply and dividenumbers mentally drawingupon known factsTo multiply and dividewhole numbers and thoseinvolving decimals by 10,100 and 1000To divide numbers up to 4digits by a one-digitnumber using the formal	Concrete	PictorialDividing by 10, 100 & 1000 TTh Th H T O 4 7 0 0 TTh Th H T O 4 7 0 TTh Th H 4 7	Abstract Short division with remainders
•	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			





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

5,291 ÷ 4 = 1,322 r3

Dividing with remainders









Divided by		
 Divided into 		
• Left		
• Loft over		
• Lejt over		









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







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

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