Grimsdyke School
Written Calculations Policy
Year 6

Approved by:	Governing Body	Date: 06.05.22
Last reviewed on:	May 2022	
Next review due by:	May 2024	

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.
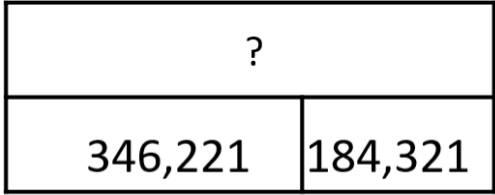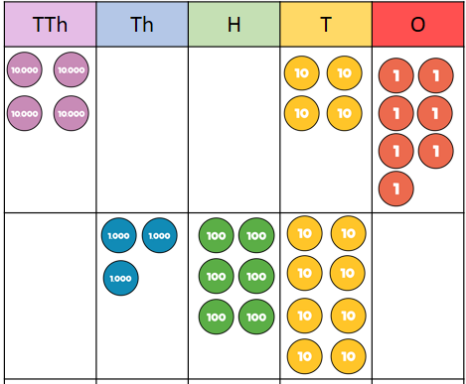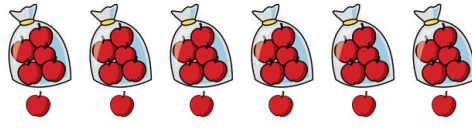
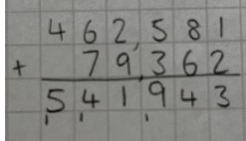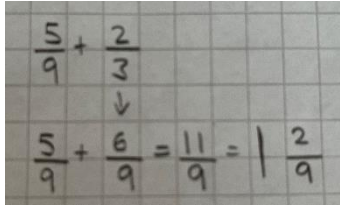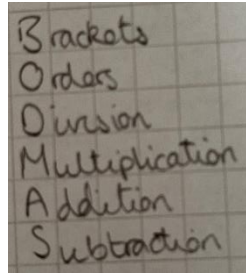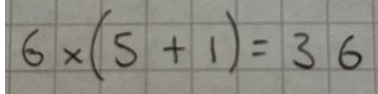## Planning, Progression and Continuity

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.
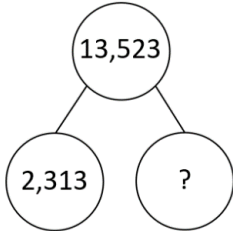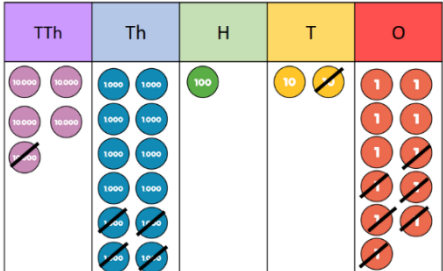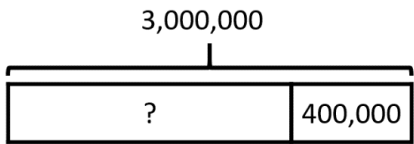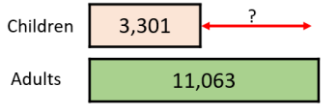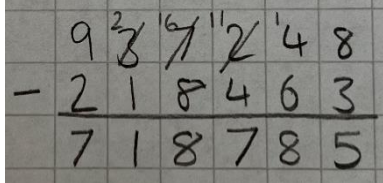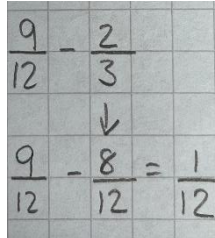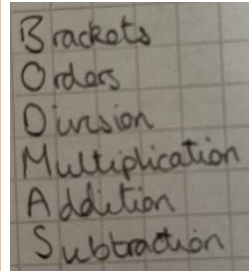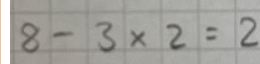
'Real things and structured images enables children to understand the abstract. The concrete and the images are a means for children to understand the symbolic so it's important to move between all modes to allow children to make connections'. (Morgan, D. 2016)

Addition

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 multi-step problems in contexts • To explore the order of operations using brackets • To add fractions with different denominators and mixed numbers, using the concept of equivalent fractions		Bar model Adding large numbers BODMAS 	Adding larger numbers Adding fractions where one denominator is a factor of the other BODMAS
Vocabulary			
• Addition • Add • More			

• *Make* • *Sum* • *Total* • *Altogether* • *Regrouping* • *Exchanging* • *Decimal point* • *BODMAS*			

Subtraction

| Objectives	Concrete	Pictorial	Abstract
• *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 multi-step 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* • *To use their knowledge of the order of operations to carry*		Part whole model Subtracting large numbers with exchanging Bar model subtractions Finding the difference 	Subtracting larger numbers Subtracting fractions where one denominator is a factor of the other BODMAS

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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 multi-step problems in contexts*
- *To subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions*
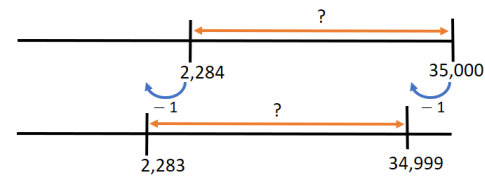
Vocabulary

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

Finding missing numbers
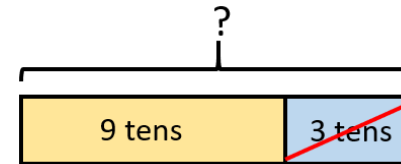
Number line for subtraction

Multiplication

Objectives	Concrete	Pictorial	Abstract

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*

Concrete

Multilink cubes to investigate square numbers:

Multilink cubes to investigate cube numbers

Pictorial

Repeated addition

Multiplying two digits by two digits.
$13 \times 13 =$

Multiplying by 10, 100 and 1000.

Abstract

Formal written method for multiplying decimals
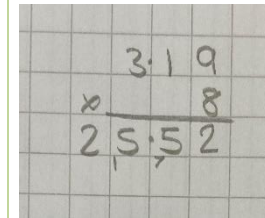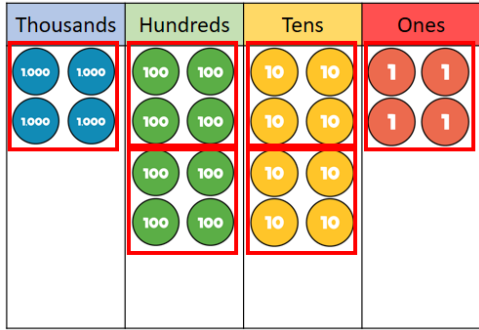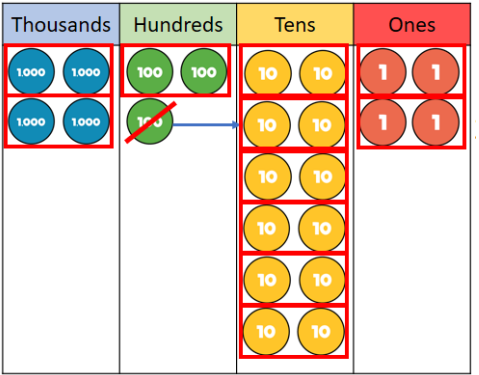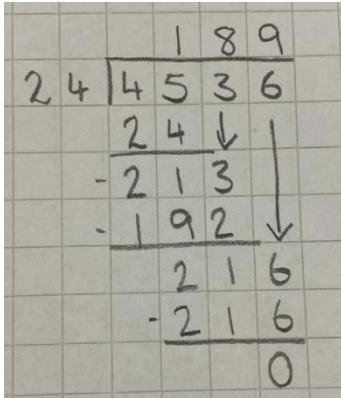

Multiplication square

- *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*
- *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*

$3.12 \times 10 =$

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				.		
			3	.	1	2

decimal places by one-digit and two-digit whole numbers

- *To multiply decimals 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

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

Division

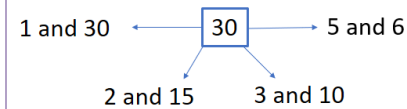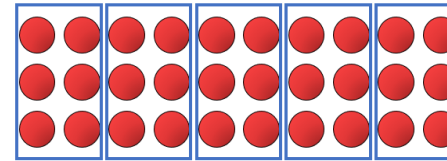| Objectives	Concrete	Pictorial	Abstract
• *To know the order of operations (BODMAS) to carry out calculations involving the four operations* • *To know that fractions are a result of division* • *To explore the order of operations using brackets* • *To multiply and divide numbers mentally drawing upon known facts* • *To multiply and divide whole numbers and those involving decimals by 10, 100 and 1000* • *To divide numbers up to 4-digits 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*		Dividing a 4-digit number by 1-digit number With remainders	Long division

using the formal written method of long division

- To interpret remainders as whole number remainders, fractions, or by rounding, 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

Finding factors

1 and 30 ← 30 → 5 and 6

2 and 15   3 and 10

• *Equation* • *Share* • *Share equally* • *Group* • *Groups of* • *Lots of* • *Array* • *Divide* • *Divided by* • *Divided into* • *Left* • *Left over* • *BODMAS*			

Written – May 2022

Next Review – May 2024