Chilham St Mary's CE Primary School

CALCULATION POLICY

Policy agreed: October 2018
Policy review: September 2021

At Chilham St Mary's, we are a diverse, loving community of learners, committed to providing firm foundations where everyone can grow in the knowledge and power of God's love. We encourage and support every individual to explore and achieve their own potential, rooted within our unique, historic environment.

PROGRESSION TOWARDS STANDARD METHODS OF CALCULATION

Introduction
The National Curriculum provides a structured and systematic approach to the teaching of calculation. The aim is for mental calculations and written procedures to be performed efficiently, fluently, accurately with understanding. Procedures and understanding are to be developed in tandem. End of key stage expectations are explicit in the programme of study.
At Chilham St Mary's CE Primary School, we have a consistent approach to the teaching of written calculation methods in order to ensure continuity and progression across the school.

Age related expectations
This calculation policy is organised according to age appropriate expectations as set out in the National Curriculum, however it is vital that pupils are taught according to the stage that they are currently working at, being moved onto the next level when appropriate, or working at a lower stage until they are secure enough to move on.

Providing a context for calculation
It is important that any type of calculation is given a real life context or problem solving approach to help build children's understanding of the purpose of calculation, and to help them recognise when to use certain operations and methods. It is also important for children to be confident to use mental and written strategies to explain their thinking. This must be a priority within calculation lessons. Written methods need to be viewed as tools to enable children to solve problems and record their thinking in an organised way.

Aims
Children should be able to use an efficient method, mental or written appropriate to the given task, with understanding. By the end of year 6, children will have been taught, and be secure with, a compact standard method for each operation.

To develop efficient written calculation strategies children need:

- Secure mental methods which are developed from early years
- A solid understanding of the number system
- Practical hands on experience including a range of manipulatives
- Visual models and images including number lines and arrays
- Experience of expanded methods to develop understanding
- Secure understanding of each stage before moving onto the next.

Before carrying out a calculation, children will be encouraged to consider:

- Can I do it in my head? (using rounding, adjustment)
- The size of an approximate answer (estimation)
- Could I use jottings to keep track of the calculation?
- Do I need to use an expanded or compact written method?

PRE-REQUISITE SKILLS FOR WRITTEN CALCULATIONS

Addition and subtraction:

- Do they know all the addition and subtraction facts for all numbers to 20?
- Do they understand place value and can they partition and then re-partition numbers?
- Can they add three single digit numbers mentally?
- Can they add and subtract any pair of two digit numbers mentally?
- Can they explain their mental strategies orally and record them using informal jottings?

Multiplication and Division:

- Do they know the 2, 5 and 10 times tables and corresponding division facts?
- Do they know the result of multiplying by 1 and 0?
- Do they understand 0 as a place holder?
- Can they multiply two and three digit numbers by 10 and 100?
- Can they double and halve two digit numbers mentally?
- Can they use multiplication and division facts they know to derive mentally other multiplication and division facts that they do not know?
- Can they explain their mental strategies orally and record them using informal jottings?

These lists are not exhaustive but are a guide for the teacher as they structure the move from informal to formal methods of calculation. It is vitally important that children's mental methods of calculation continued to be practised and secured alongside their learning and use of an efficient written method for each operation.

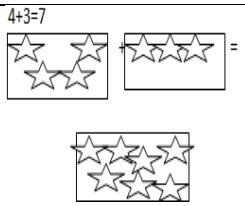
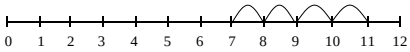
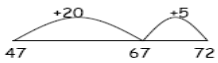
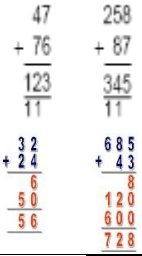
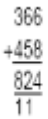
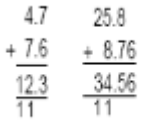
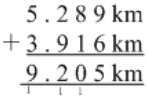
A PATHWAY TO TEACHING CALCULATION METHODS:

Expanded methods should be viewed as steps towards a standard method and not as methods in themselves.
Before beginning to record in a more refined written format children must have had significant practical work reinforced with appropriate manipulatives, models and images.
Teachers will guide pupils to refine their written methods of recording by modelling and asking questions such as "What is the same? What's different?"

Learning will be planned to ensure pupils are encouraged to use and apply what they have learnt to problem solving tasks.
As children move along the pathway it is vital that they practice, reinforce, consolidate, use and apply it to mathematical learning and NOT simply move onto the next step.

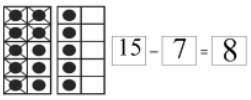
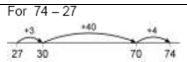
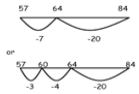
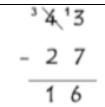
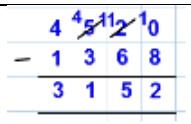
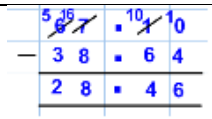
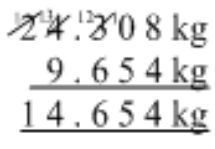
Point to note:
Teachers should refer to the programme of study for key vocabulary for each year group.
For all mathematical areas teachers may start the year by revising methods from previous year groups.

Progression in Addition including fractions

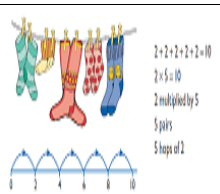
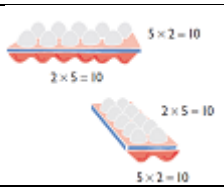
	Whole numbers and decimals Supported by the use of the following manipulatives: Counters, Numicon, Dienes and Place Value Counters.		**Fractions** Supported by the use of the following manipulatives: Fraction walls, towers and discs.
Foundation	Count … from 1-20 … and say which number is 1 more than a given number. Using objects, add two numbers less than 10 and count on to find the answer.	 7+1=8 8+1=9 9+□=10	
Year 1	Add one-digit and two-digit numbers to 20 (9 + 8), including zero Read/write/interpret statements involving addition (+) and equals (=) signs.	**Number lines** (numbered) 7 + 4  Recording by - drawing jumps on prepared lines 5 + 4 = = 5 + 4 5 + □ = 9 9 = □ + 4	
Year 2	**TO + O** **TO + T** **TO + TO** **O + O + O horizontally supported by numberlines and manipulatives** [Show addition of two numbers can be done in any order.] Adding 2 digit numbers not bridging 10 and then bridging using manipulatives introducing vertical recording with expanded methods.	Use of empty numberlines - constructing own lines  or  This requires place value knowledge and partitioning of tens and units	
Year 3	Use **formal** written methods of **columnar addition**. **TO + TO** **HTO + TO** **HTO + HTO**		Add fractions with the same denominator within one whole $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$
Year 4	Use **formal** written methods of **columnar addition**. **HTO + HTO** **ThHTO + HTO** **ThHTO + ThHTO**		Add fractions with the same denominator. $\frac{5}{7} + \frac{3}{7} = \frac{8}{7} = 1\frac{1}{7}$
Year 5	**Vertical Column Method** Column addition is efficient even with larger whole numbers greater than (>) 4 digits and decimals to 2 decimal places.		Add fractions with the same denominator and multiples of the same number. $\frac{4}{6} + \frac{1}{12} = \frac{9}{12}$
Year 6	**Vertical Column Method** Column addition is efficient even with larger whole numbers and decimals to 3 decimal places.		Add fractions with different denominators and mixed numbers, using equivalent fractions.

Love Trust Respect Honesty Forgiveness Perseverance

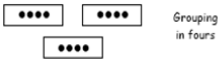
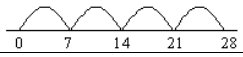
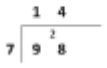
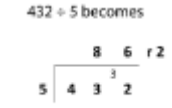
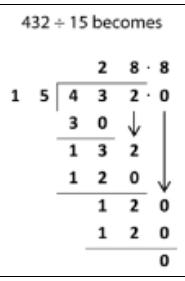
Progression in Subtraction including fractions

	Whole numbers and decimals Supported by the use of the following manipulatives: Counters, Numicon, Dienes and Place Value Counters.		**Fractions** Supported by the use of the following manipulatives: Fraction walls, towers and discs.
Foundation	Count … from 1-20 … and say which number is 1 less than a given number. Using objects, subtract a small number from a number less than 10 and count back to find the answer.	5 - 2 = __ I had five balloons. Two burst. How many did I have left?  	
Year 1	Subtract one-digit and two-digit numbers to 20 (18 - 9), including zero Read/write/interpret statements involving subtraction (-) and equals (=) signs	 	
Year 2	**TO- TO** **TO - T** **TO - TO** [Show subtraction of two numbers cannot be done in any order.] Use number lines to count on and back. Move towards formal written methods of column subtraction using manipulatives	For 74 – 27  To get the answer, the child mentally adds the steps that were made: 40 + 3 + 4 = 47. 84 - 27 = __ I cut 27 cm off a ribbon measuring 84 cm. How much is left?  	
Year 3	Use **formal** written methods of **columnar subtraction** **TO - TO** **HTO - TO** **HTO - HTO**	 	Subtract fractions with the same denominator within one whole $\frac{5}{7} - \frac{1}{7} = \frac{4}{7}$
Year 4	Use **formal** written methods of **columnar subtraction**. **HTO - HTO** **ThHTO - TO** **ThHTO - HTO** **ThHTO - ThHTO**	 	Subtract fractions with the same denominator. $\frac{5}{6} - \frac{2}{6} = \frac{3}{6}$
Year 5	Subtract whole numbers >4 digits, including using **formal** methods (**columnar subtraction**). Decimals up to 2 decimal places (eg 72.5 - 45.7)	 	Subtract fractions with the same denominator and multiples of the same number.
Year 6	Solve multi-step problems in contexts, deciding which operations/methods to use and why. Decimals up to 3 decimal places (Context: Measures)	 	Subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.

Progression in Multiplication including fractions

	Whole numbers and decimals Supported by the use of the following manipulatives: Counters, Numicon, Dienes and Place Value Counters.		**Fractions** Supported by the use of the following manipulatives: Fraction walls, towers and discs.
Foundation	Children … solve problems, including doubling. [Expected] Solve practical problems that involve combining groups of 2/5/10. [Exceeding]		
Year 1	Solve one-step problems using concrete objects, pictorial representations and arrays *(with the support of the teacher)*		
Year 2	Calculate statements for multiplication within the multiplication tables and write them using the multiplication and equals signs. [Show multiplication of two numbers can be done in any order.]	3 x 4 = 12 4 x 3 = 12	
Year 3	Write/calculate statements using the multiplication tables that they know (progressing to **formal** written methods). **TO x O** (multiplier is 2/3/4/5/8/10) Visual aids and manipulatives still in use e.g. arrays and numicon	13 x 7 = (10 x 7) + (3 X 7) = 70 + 21 = 91 x 30 8 5 150 40 190 38 X 5 190 4	
Year 4	Use **formal** written layout: **TO x O** **HTO x O** Convert between different units of measure [eg km to m; hr to mi]	42 X 7 294 1	
Year 5	Use a **formal** written method (including long x for TU nos) **TO x TO** **HTO x O / HTO x TO** **ThHTO x O** Convert between units of measure (eg km/m; m/cm; cm/mm; kg/g; litre and ml)	52 x 14 208 + 520 728	Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.
Year 6	Multi-digit numbers (up to 4 digits) x TU whole number using the **formal** method of **long multiplication**. Multiply one-digit numbers with up to two decimal places by whole numbers	3456 x 42 6912 + 138240 145152	Multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. $^1/_4 \times {}^1/_2 = {}^1/_8$)

Progression in Division including fractions

	Whole numbers and decimals Supported by the use of the following manipulatives: Counters, Numicon, Dienes and Place Value Counters.		**Fractions** Supported by the use of the following manipulatives: Fraction walls
Foundation	Children … solve problems, including, halving and sharing. [Expected] They solve practical problems that involve sharing into equal groups. [Exceeding]	6 lollies are shared between 2 children. How many lollies does each child get?  sharing between 2	
Year 1	Solve one-step problems using concrete objects, pictorial representations and arrays *(with the support of the teacher)*	4 apples are packed in a basket. How many baskets can you fill with 12 apples?  Grouping in fours	
Year 2	Calculate statements within the multiplication tables and write them using the division and equals signs. [Show division of two numbers <u>cannot</u> be done in any order.]	4 × 5 = 20 and 20 ÷ 5 = 4 28÷7=☐ A chew bar costs 7p. How many can I buy with 28p?  	Find ⅓, ¼, ²⁄₄, ¾ of a length/objects/quantity. Write simple fractions e.g. ½ of 6 = 3
Year 3	Write/calculate statements using the tables that they know (progressing to **formal** written methods). **TO ÷ O** (divisor is 2/3/4/5/8/10)	Use 3 × 2 = 6, 6 ÷ 3 = 2 to derive related facts 30 × 2 = 60, 60 ÷ 3 = 20 	
Year 4	Pupils practise to become fluent in the **formal** written method of **short division** with exact answers **TO ÷ O; HTO ÷ O**	98 ÷ 7 becomes 	
Year 5	Use the **formal** written method of **short division** (interpret remainders appropriately for the context). **HTO ÷ O** **ThHTO ÷ O** Convert between units of measure (eg km/m; m/cm; cm/mm; kg/g; litre and ml)	432 ÷ 5 becomes  Answer: 86 remainder 2	
Year 6	Divide numbers (up to 4 digits) by TO whole number using the **formal** method of **short/long division** (interpret as approp. for the context). Use written division methods in cases where the answer has up to 2 decimal places. *[Divide numbers up to 2decimal places by Units /Tens Units whole numbers.]*	432 ÷ 15 becomes 	Divide proper fractions by whole numbers (e.g. $^{1}/_{3} \div 2 = {}^{1}/_{6}$)

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