A school where every child can shine

Kirk Langley CE Primary School

CALCULATIONS POLICY

Version History	
Date	**Detail**
January 2019	Agreed by staff Approved by Governors
Autumn 2020	Agreed by staff Approved by Governors
Reviewed Autumn 2021	Agreed by staff Approved by Governors
Reviewed Autumn 2022	Agreed by Staff Approved by Governors
Reviewed Autumn 2023	Agreed by Staff Approved by Governors

Kirk Langley is a Church of England Primary School and our family believe that 'Every Child Can Shine.' Our visions and values, built on the living Gospel of Christ within daily life, are at the core of everything we do. They underpin our teaching and learning and provide an environment which prepares our pupils in being respectful, confident, thriving citizens.

Daniel 12:3

'Those who have insight will shine brightly like the brightness of the expanse of heaven, and those who lead the many to righteousness, like the stars forever and ever.'

We aim to provide a thriving, inspiring and stimulating learning environment where children achieve the very best they are capable of because all the staff value their different learning styles. Kirk Langley Church of England Primary School is committed to Christian values where children, parents/carers and our community know us by our actions.

Within a Christian ethos we aim to:

- Promote a positive attitude to life-long learning, nurturing the development of self-esteem; leading to aspirational, independent learners that are prepared to be challenged and take risks in a diverse and ever changing world.
- Provide the children with valuable experiences and opportunities, through a broad, balanced and exciting curriculum, where learning is purposeful and engaging.
- Use a variety of teaching strategies and resources effectively and creatively; encouraging each child to progress and attain to the highest possible standards, in relation to their age and ability.
- Strongly believe in the partnership of parental involvement in the education of our pupils.
- Demonstrate and foster respect for ourselves and others within the school, local community and the global community.
- Respect the belief of others and celebrate cultural diversity.
- Encourage spiritual and moral values.
- Explicitly promote the fundamental British values of democracy, the rule of law, individual liberty and mutual respect and tolerance of those with different faiths and beliefs through a 'living' curriculum.
- Value each child as an individual within the school and respect personal beliefs.

Kirk Langley C.E. Primary School

Calculations Policy N.C. 2014

The following 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 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.

Age stage expectations:

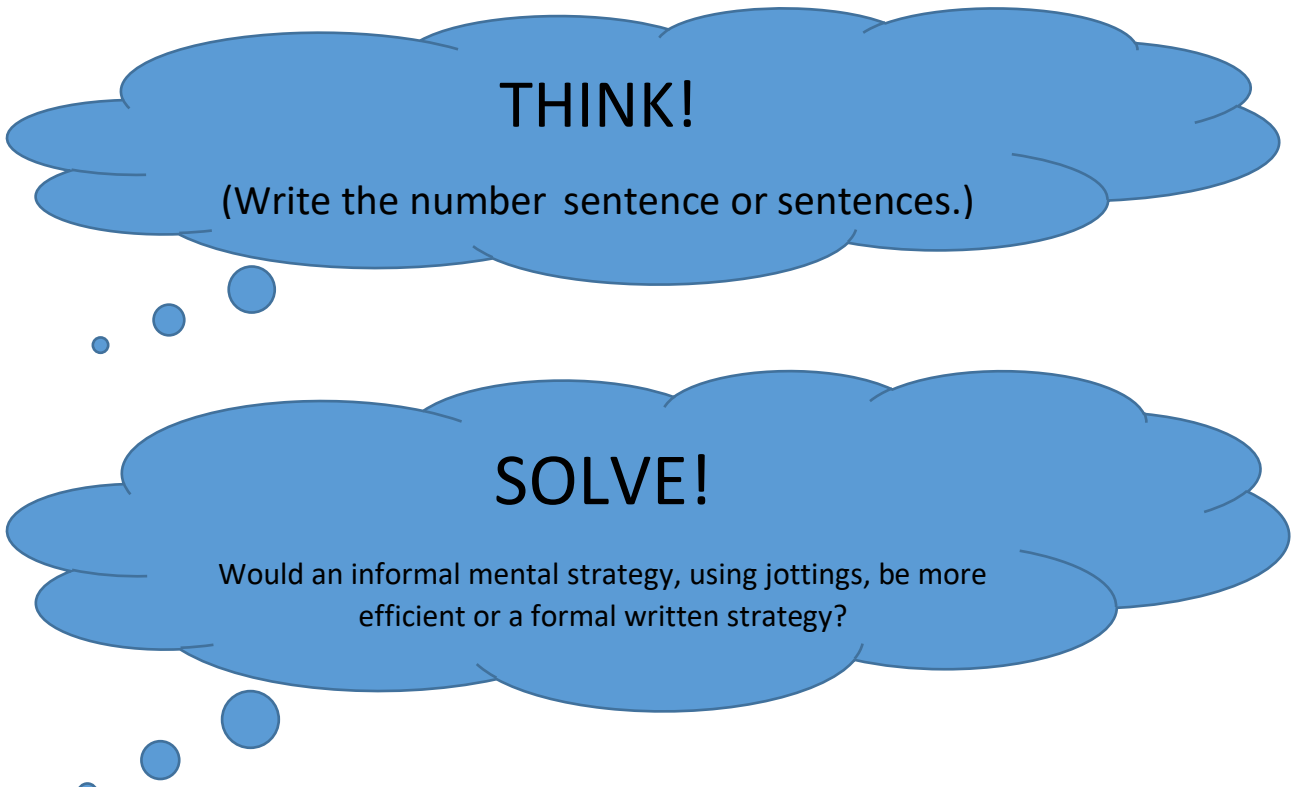
The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014.

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 when faced with problems. This must be a priority within calculation lessons.

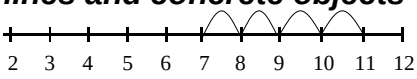
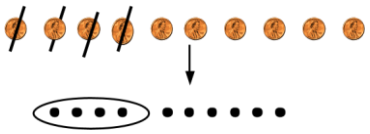
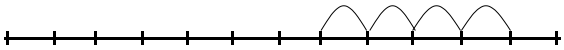
Choosing a calculation method:

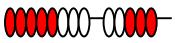
Children need to be taught and encouraged to use the following processes in deciding what approach they will take to a calculation, to ensure they select the most appropriate method for the numbers involved.



EXPLAIN!

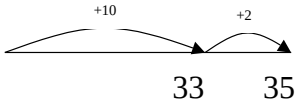
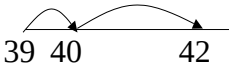
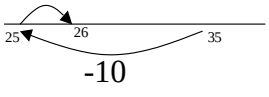
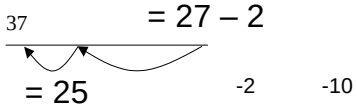
(Return to the original problem and write a response.)

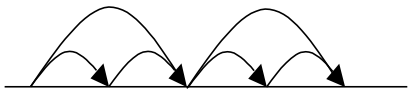
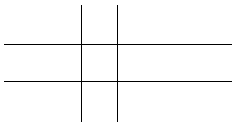
New Mathematics Calculation Policy: Year 1	
Addition	**Subtraction**
AS1.1 & AS1.2 The + and = signs and missing numbers Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'. ***Example*** 2 = 1+ 1 2 + 3 = 4 + 1 3 = 3 2 + 2 + 2 = 4 + 2 Missing numbers need to be placed in all possible places. 3 + 4 = = 3 + 4 3 + = 7 7 = + 4 + 4 = 7 7 = 3 + ***NPV1.4, AS1.3 & AS1.4 Use of prepared number lines and concrete objects***  Children are encouraged to record by drawing jumps on prepared lines.	***AS1.1 & AS1.2 The - and = signs and missing numbers*** The notes opposite are relevant here. 7 - 3 = = 7 - 3 7 - = 4 4 = - 3 ***NPV1.4, AS1.3 & AS1.4 Use of pictures, marks and concrete objects*** Sam spent 4p. What was his change from 10p?  **Number Lines** ***NPV1.4, AS1.3 & AS1.4 Example- Counting Back/Down*** 11 – 7 0 1 2 3 4 5 6 7 8 9 10 11 12  ***NPV1.4, AS1.3 & AS1.4 Example- Counting On/Up*** The difference between 7 and 11  0 1 2 3 4 5 6 7 8 9 10 11 12 Children are encouraged to record by drawing jumps on prepared lines and constructing their own lines.

Multiplication	Division
MD1.1, F1.1 & F1.2 Use of pictures and objects There are 3 sweets in one bag. How many sweets are there in 5 bags?  **NPV1.2 Count in multiples of one, two, five and ten** Counting steps using bead string and on prepared number lines.  Counting in multiples using a range of objects, e.g. pairs of legs on animals; fingers in gloves etc. **NPV1.4 & MD1.1 Use of arrays** Counting in rows and columns  Two groups of three is six Three groups of two is six So 6 = 2 + 2 +2 or 6 = 3 + 3	**MD1.1, F1.1 & F1.2 Use of pictures and objects or marks** 12 children get into teams of 4 to play a game. How many teams are there?  **MD1.1 Sharing** 6 sweets are shared between 2 people. How many do they have each?  Make use of practical activities involving sharing, e.g. distributing cards when playing a game, putting objects onto plates, into cups, hoops etc.

Video clips: Using a range of equipment and strategies to reinforce addition statements / bonds to 10

New Curriculum Mathematics Calculation Policy: Year 2

Addition	Subtraction
AS2.3 & AS2.8 The + and = signs and missing numbers Continue using a range of equations (See Year 1) but with appropriate, larger numbers as specified in Year 2 age-related expectations. i.e. extend to 14 + 5 = 10 + and 32 + + = 100 35 = 1 + + 5. **AS2.6 Partition into tens and ones and recombine** 12 + 23 = 10 + 2 + 20 + 3 = 30 + 5 = 35 **AS2.6 Partitioning the second number only** 23 + 12 = 23 + 10 + 2 = 33 + 2 = 35  **AS4.2, AS2.5 & AS2.6** Example: Add 9 or 11 by adding 10 and adjusting by 1 35 + 9 = 44	**AS2.3 & AS2.8 The – and = signs and missing numbers** Continue using a range of equations (See Year 1) but with appropriate numbers in relation to Year 2 age-related expectations. i.e. extend to 14 + 5 = 20 . **AS2.6 Find a small difference by counting up** 42 – 39 = 3 + 1 + 2  **AS2.4, AS2.5 & AS2.6** **Example: Subtract 9 or 11 & begin to add/subtract 19 or 21** 35 – 9 = 26 +1  **AS2.6 Use known number facts and place value to subtract** (Partition second number only) 37 – 12 = 37 – 10 – 2 = 27 – 2 = 25 

Multiplication	Division
MD2.1, MD2.2 & MD2.4 The x and = signs and missing numbers 7 x 2 = = 2 x 7 7 x = 14 14 = x 7 x 2 = 14 14 = 2 x **MD2.5 Use materials, arrays, repeated addition (including solving problems in context)** ●● ●● ●● ●● 4 x 2 or 4 + 4 ●● ●● ●● ●● 2 x 4  Or repeated addition 2 + 2 + 2 + 2 **NPV2.2 & NPV2.6 Partitioning** ***15 x 2***  20 + 10 = 30	**MD2.1, MD2.2 & MD2.4 The ÷ and = signs and missing numbers** 6 ÷ 2 = = 6 ÷ 2 6 ÷ = 3 3 = 6 ÷ ÷ 2 = 3 3 = ÷ 2 **MD2.5 Use materials, arrays, repeated addition (including solving problems in context)** ***Use of sharing and grouping*** ***Sharing*** 6 sweets are shared between 2 people. How many do they have each? ●● ●● ●● ●● ●● ●● ***Grouping*** There are 6 sweets. How many people can have 2 each? (How many 2's make 6?)  0 2 4 6 **F2.1 Find and name fractions of length, shape and sets of objects and quantities** Use of diagrams- count all equal parts to determine denominator. Link to division into equal groups/parts.

Video clips: 1. Teaching for understanding of multiplication facts
2. Practical multiplication and the commutative law

New Curriculum Mathematics Calculation Policy: Year 3*

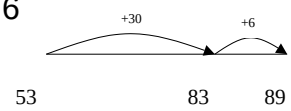
Addition

The + and = signs and missing numbers
Continue using a range of equations as in Year 1 and Year 2 but with appropriate larger numbers.

AS3.1, AS3.2 & AS3.3 Progression in mental calculations with larger numbers
Calculate HTU + U
Calculate HTU + TU
Calculate HTU + HTU
Progress from no crossing of boundaries to crossing of boundary.

Partition into tens and ones and recombine Develop from Year 2- partitioning both numbers and recombining.

Refine to partitioning the second number only:
36 + 53 = 53 + 30 + 6
= 83 + 6
= 89



Add a near multiple of 10 to a two-digit number Continue work from Year 2 but with appropriate numbers: 35 + 19 is the same as 35 + 20 – 1.

AS3.4 & M3.3 Extend to decimals in the context of money

£ 2.50 + £ 1.75

	£ 2.50
+	£ 1.75
	£ 4.25
	1

The expanded method should be used if children experience persisting difficulties.

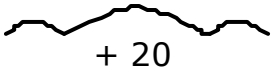
Subtraction

The - and = signs and missing numbers
Continue using a range of equations as in Year 1 and Year 2 but with appropriate larger numbers.

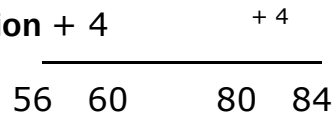
Find a small difference by counting up
Continue from Year 2 but with appropriate numbers, e.g. 102 – 97 = 5

AS3.1, AS3.2 & AS3.3 Subtract mentally a 'near multiple of 10' to or from a two-digit number, extending to three digit numbers
Continue as in Year 2 but with appropriate numbers e.g. 78 – 49 is the same as 78 – 50 + 1

AS3.1, AS3.2 & AS3.3 Progression in mental calculations with larger numbers Calculate HTU - U
Calculate HTU - T
Calculate HTU - H
Progress from no crossing of boundaries to crossing of boundary.



Complementary addition
84 – 56 = 28



AS3.4 Formal methods of columnar subtraction to subtract numbers with up to three digits
See Appendix 1 examples in Year 5 and Year 6 section of this document.

***From Year 3 onwards, teachers need to keep in mind the methods specified in the age-appropriate standards for end of Key Stage 2 (See Year 5 and Year 6 Calculation Policy Document). Children should be developing their capacity to use formal written methods for all four number operations.**

Multiplication	Division
MD3.1 & MD3.2 The x and = signs and missing numbers Continue using a range of equations as in Year 2 but with appropriate numbers in relation to age-related expectations. **MD3.2 TU x U** Use known facts x3, x4, x8 (Year 3 grade-level standards) and x2, x5 and x10 (Year 2 age-related expectations.). At Year 3, children progress to using more formal written methods. In this case, the grid method drawing on knowledge of place value, multiplication facts and their ability to recombine partitioned numbers to derive an answer.	**MD3.2 The ÷ and = signs and missing numbers** Continue using a range of equations as in Year 2 but with appropriate numbers in relation to age-related expectations.. **MD3.2 TU ÷ U Grouping**  How many 3s make 18? 0 3 6 9 12 15 18 **MD3.2 & MD3.3 Remainders** 16 ÷ 3 = 5 r1 Sharing – There are 16 sweets shared between 3, how many left over? Grouping – How many 3s make 16, how many left over?  0 3 6 9 12 15 16 Children with secure knowledge of multiplication facts and subtraction may progress to 'chunking' where TU are divided by U.

Video clips: 1. Demonstration of expanded 3-digit column addition
2, Subtraction—teaching children to consider the most appropriate methods before calculating
3. Introducing partitioned column subtraction method, from practical to written

New Mathematics Calculation Policy: Year 4

Addition

The + and = signs and missing numbers
Continue using a range of equations as in Key Stage 1 and Year 3 but with appropriate numbers.

Partition into hundreds, tens and ones and recombine Either partition both numbers and recombine or partition the second number only e.g.

358 + 73 = 358 + 70 + 3
= 428 + 3
= 431

Add or subtract the nearest multiple of 10 or 100, then adjust
Continue as in Year 2, 3 and 4 but with appropriate numbers e.g. 458 + 79 = is the same as 458 + 80 - 1

AS4.1 Addition of numbers with at least four digits using formal method of columnar addition

358
+73
431
1 1

3587
+675
4262
1 1 1

The formal, efficient method of columnar addition will involve crossing of boundaries (at the tens, hundreds and/or thousands). Take a systematic approach to teaching this looking at crossing each boundary in turn before mixed practice.

Revert to expanded method if children experience difficulties.

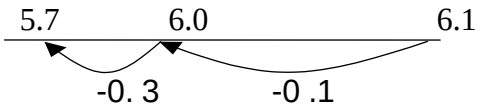
DF4.6 Extend addition to decimals (same number of decimals places) and adding several numbers (with different numbers of digits).

Subtraction

The – and = signs and missing numbers
Continue using a range of equations as in Key Stage 1 and Year 3 but with appropriate numbers.

Differences
Find a difference by counting up, e.g. 8006 – 2993 = 5013. This can be modelled on an empty number line.

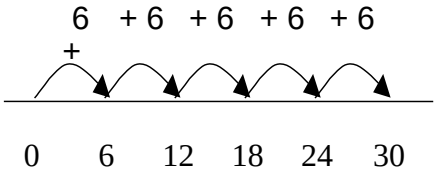
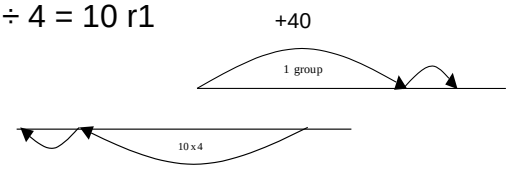
DF4.6 Use known number facts and place value to subtract
6.1 – 0.4 = 5.7



AS4.1 Subtraction with at least four digits using formal method of columnar subtraction
For instance, 6467 – 2684 = 3783
Using expanded column subtraction where children experience difficulty with decomposition and need to 'see' this.

DF4.6 Extend subtraction to decimals (same number of decimals places) and adding several numbers (with different numbers of digits)

Video clips: 1. Subtraction—teaching children to consider the most appropriate methods before calculating
2. Introducing partitioned column subtraction method, from practical to written
3, Moving to the compact column method of subtraction

Multiplication	Division
The x and = signs and missing numbers Continue using a range of equations but with appropriate numbers for Year 4. **MD4.5 TU x U** (See Year 3) **and HTU x U** (Introduced in Year 4 age-related expectations). **Partition** 23 x 4 = 92 23 x 4 = (20 x 4) + (3 x 4) = (80) + (12) = 92	**The ÷ and = signs and missing numbers** Continue using a range of equations but with appropriate numbers for Year 4. **MD4.3 Sharing and grouping** 30 ÷ 6 can be modelled as: Grouping – groups of 6 taken away and the number of groups counted e.g.  Sharing – sharing among 6, the number given to each person. **Remainders** Note three approaches below: 41 ÷ 4 = 10 r1  41 = (10 x 4) + 1 **MD4.5 TU ÷ U** 72 ÷ 5 = Division will use the **exchange method** and this extends to using a two digit divisor. **MD4.5 HTU ÷ U** Can progress from no remainder to remainders. Where remainders are involved, care needs to be taken to ensure they are interpreted correctly in context of problems.

New Mathematics Calculation Policy: Year 5 and Year 6

The exemplification of formal methods here should be taken into account by all Key Stage 2 teachers so children are adequately prepared by Year 5 and into Year 6 to use the means of calculating specified in age-related expectations.

Addition & Subtraction

AS5.1 Columnar Addition & Subtraction

789 + 642 becomes

$$\begin{array}{r} 7\ 8\ 9 \\ +\ 6\ 4\ 2 \\ \hline 1\ 4\ 3\ 1 \\ \hline 1\ \ 1 \end{array}$$

Answer: 1431

874 – 523 becomes

$$\begin{array}{r} 8\ 7\ 4 \\ -\ 5\ 2\ 3 \\ \hline 3\ 5\ 1 \end{array}$$

Answer: 351

932 – 457 becomes

$$\begin{array}{r} {\scriptstyle 8\ \ 12\ \ 1} \\ 9\ \not{3}\ \not{2} \\ -\ 4\ 5\ 7 \\ \hline 4\ 7\ 5 \end{array}$$

Answer: 475

932 – 457 becomes

$$\begin{array}{r} {\scriptstyle 1\ \ 1} \\ 9\ 3\ 2 \\ -\ \not{4}\ \not{5}\ 7 \\ {\scriptstyle 5\ \ 6} \\ \hline 4\ 7\ 5 \end{array}$$

Answer: 475

Multiplication & Division

MD5.5 Short Multiplication (DfE, 2013, Appendix 1)

24 × 6 becomes

$$\begin{array}{r} {\scriptstyle 2} \\ 2\ 4 \\ \times\ \ 6 \\ \hline 1\ 4\ 4 \end{array}$$

Answer: 144

342 × 7 becomes

$$\begin{array}{r} {\scriptstyle 2\ \ 1} \\ 3\ 4\ 2 \\ \times\ \ 7 \\ \hline 2\ 3\ 9\ 4 \end{array}$$

Answer: 2394

2741 × 6 becomes

$$\begin{array}{r} {\scriptstyle 4\ \ 2} \\ 2\ 7\ 4\ 1 \\ \times\ \ 6 \\ \hline 1\ 6\ 4\ 4\ 6 \end{array}$$

Answer: 16 446

MD5.7 & ASMD6.2b Short Division (DfE, 2013, Appendix 1)

98 ÷ 7 becomes

$$\begin{array}{r} 1\ 4 \\ 7\overline{)\ 9\ 8} \\ {\scriptstyle 2} \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 8\ 6\ \text{r}\,2 \\ 5\overline{)\ 4\ 3\ 2} \\ {\scriptstyle 3} \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 4\ 5\ \text{r}\,1 \\ 11\overline{)\ 4\ 9\ 6} \\ {\scriptstyle 5} \end{array}$$

Answer: $45\frac{1}{11}$

MD5.5 & ASMD6.1 Long Multiplication (DfE, 2013, Appendix 1)

24 × 16 becomes

$$\begin{array}{r} {\scriptstyle 2} \\ 2\ 4 \\ \times\ 1\ 6 \\ \hline 2\ 4\ 0 \\ 1\ 4\ 4 \\ \hline 3\ 8\ 4 \end{array}$$

Answer: 384

124 × 26 becomes

$$\begin{array}{r} {\scriptstyle 1\ \ 2} \\ 1\ 2\ 4 \\ \times\ \ 2\ 6 \\ \hline 2\ 4\ 8\ 0 \\ 7\ 4\ 4 \\ \hline 3\ 2\ 2\ 4 \\ {\scriptstyle 1\ \ 1} \end{array}$$

Answer: 3224

124 × 26 becomes

$$\begin{array}{r} {\scriptstyle 1\ \ 2} \\ 1\ 2\ 4 \\ \times\ \ 2\ 6 \\ \hline 7\ 4\ 4 \\ 2\ 4\ 8\ 0 \\ \hline 3\ 2\ 2\ 4 \\ {\scriptstyle 1\ \ 1} \end{array}$$

Answer: 3224