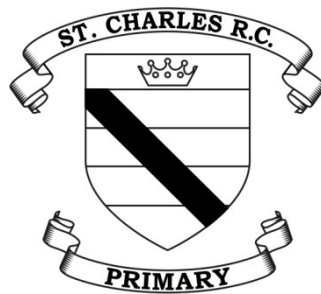


St Charles RC Primary School

Calculation Policy

2016-17



CHRIST IS AT THE CENTRE



Compassionate
Helpful
Respectful
Inclusive
Sharing
Truthful



St Charles RC Primary School

Calculation Policy

2016-17



Our mission at St. Charles RC Primary School is to try and centre our life in Jesus Christ, the spiritual foundation of our community.

We aim to pass on the faith we share in partnership with you.

We want the children in our care to grow and develop to their full potential within a caring Catholic community which recognises fully their true worth and God given talents. We look forward to working with you in a spirit of mutual trust and support.

We take pride belonging to St. Charles RC Primary School.

MISSION STATEMENT

As a family of God, we love to learn and learn to love

Introduction

REASONS FOR USING WRITTEN METHODS

- To aid mental calculation by writing down some of the numbers and answers involved
- To make clear a mental procedure for the pupil
- To help communicate methods and solutions

- To provide a record of work to be done
- To aid calculation when the problem is too difficult to be done mentally
- To develop and refine a set of rules for calculations

WHEN ARE CHILDREN READY FOR WRITTEN CALCULATIONS?

Addition and subtraction

- Do they know addition and subtraction facts to 20?
- Do they understand place value and can they 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, 3, 4, 5 and 10 time table
- Do they know the result of multiplying by 0 and 1?
- 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 facts they know to derive mentally other multiplication facts that they do not know?
- Can they explain their mental strategies orally and record them using informal jottings?

The above lists are not exhaustive but are a guide for the teacher to judge when a child is ready to move from informal to formal methods of calculation.

Calculation Guidelines for Early Years Foundation Stage

- Children begin to record in the context of play or practical activities and problems.
- Begin to relate addition to combining two groups of objects
- Make a record in pictures, words or symbols of addition activities already carried out.
- Construct number sentences to go with practical activities
- Use of games, songs and practical activities to begin using vocabulary
- Solve simple word problems using their fingers

- Can find one more to ten.
- Higher Ability/ Gifted and Talented children progress to using a number line.
- They jump forwards along the number line using finger.
- Begin to relate subtraction to 'taking away'
- Make a record in pictures, words or symbols of subtraction activities already carried out
- Use of games, songs and practical activities to begin using vocabulary
- Construct number sentences to go with practical activities
- Relate subtraction to taking away and counting how many objects are left.
- Can find one less to ten.

Higher Ability/ Gifted and Talented Progression

- Counting backwards along a number line using finger.
- Real life contexts and use of practical equipment to count in repeated groups of the same size:
- Count in twos; fives; tens Also chanting in 2s, 5s and 10s.
- Share objects into equal groups
- Use related vocabulary
- Activities might include:
 - Sharing of milk at break time
 - Sharing sweets on a child's birthday
 - Sharing activities in the home corner
 - Count in tens/twos
- Separate a given number of objects into two groups (addition and subtraction objective in reception being preliminary to multiplication and division)
- Count in twos, tens How many times? How many are left/left over?
- What could we try next? How did you work it out?
- Share out Half, halve

ADDITION GUIDELINES Year 1, 2 and 3

- + = 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'. $2 = 1 + 1$ $2 + 3 = 4 + 1$ $3 = 3$ $2 + 2 + 2 = 4 + 2$
- Missing numbers need to be placed in all possible places. $3 + 4 = \quad = 3 + 4$ $3 + \quad = 7$
 $7 = \quad + 4$ $\quad + 4 = 7$ $7 = 3 + \quad$ $\quad + \nabla = 7$ $7 = \quad + \nabla$

The Number Line

- Children use a numbered line to count on in ones.

- Children use number lines and practical resources to support calculation and teachers demonstrate the use of the number line. $7 + 4 =$ signs and missing numbers
- Continue using a range of equations as in Year 1 but with appropriate, larger numbers. Extend to $14 + 5 = 10 +$ and $32 + + = 100$ $35 = 1 + + 5$
- Partition into tens and ones and recombine $12 + 23 = 10 + 2 + 20 + 3 = 30 + 5 = 35$
- Count on in tens and ones $23 + 12 = 23 + 10 + 2 = 33 + 2 = 35$

The Empty Number Line:

- Partitioning and bridging through 10.
- The steps in addition often bridge through a multiple of 10 e.g. Children should be able to partition the 7 to relate adding the 2 and then the 5. $8 + 7 = 15$
- Add 9 or 11 by adding 10 and adjusting by 1 $=$ signs and missing numbers
- Continue using a range of equations as in Year 1 and 2 but with appropriate, larger numbers.
- Partition into tens and ones
- Partition both numbers and recombine.
- Count on by partitioning the second number only e.g. $36 + 53 = 53 + 30 + 6 = 83 + 6 = 89$
- Add a near multiple of 10 to a two-digit number
- Secure mental methods by using a number line to model the method.
- Continue as in Year 2 but with appropriate numbers e.g. $35 + 19$ is the same as $35 + 20 - 1$.
- Children need to be secure adding multiples of 10 to any two-digit number including those that are not multiples of 10. $48 + 36 = 84$ pencil and paper procedures $83 + 42 = 125$ either or 1.
- Vertical expansion
- Horizontal expansion Add 9 by adding 10 and adjusting by 1 $35 + 9 = 44 + 10 - 1 +$ $42 + 40 + 2$ 5 $120 + 5 = 125$ 120 125 35 44 45

ADDITION GUIDELINES Year 4, 5 AND 6

- $=$ signs and missing numbers
- Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.
- Partition into tens and ones and recombine
- Either partition both numbers and recombine or partition the second number only e.g. $55 + 37 = 55 + 30 + 7 = 85 + 7 = 92$
- Add the nearest multiple of 10, then adjust
- Continue as in Year 2 and 3 but with appropriate numbers e.g. $63 + 29$ is the same as $63 + 30 - 1$

- Pencil and paper procedures $367 + 185 = 431$ either or $367\ 300 + 60 + 7 + 185\ 100 + 80 + 5\ 12\ 400 + 140 + 12 = 552\ 140\ 400\ 552$ leading to 367
- + = signs and missing numbers
- Continue using a range of equations as in Year 1 and 2 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 $458 + 80 - 1$

Pencil and paper procedures

- Extend to numbers with at least four digits $3587 + 675 = 4262\ 3587 + 675\ 4262$
- Revert to expanded methods if the children experience any difficulty.
- Extend to up to two places of decimals (same number of + = signs and missing numbers)
- Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.
- Partition into hundreds, tens, ones and decimal fractions and recombine
- Either partition both numbers and recombine or partition the second number only e.g. $35.8 + 7.3 = 35.8 + 7 + 0.3 = 42.8 + 0.3 = 43.1$
- Add the nearest multiple of 10, 100 or 1000, then adjust
- Continue as in Year 2, 3, 4 and 5 but with appropriate numbers including extending to adding 0.9, 1.9, 2.9 etc

Pencil and paper procedures

- Extend to numbers with any number of digits and decimals with 1, 2 and/or 3 decimal places. $13.86 + 9.481 = 23.341\ 13.86 + 9.481\ 23.341$
- Revert to expanded methods if the children experience any difficulty. $55\ 85\ 92 + 30 + 7\ 358\ 428\ 431 + 70 + 3\ 35.8\ 42.8\ 43.1 + 7 + 0.3 + 185\ 552$
- Extend to decimals in the context of money (decimal places) and adding several numbers (with different numbers of digits). $72.8 + 54.6\ 127.4\ 1\ 1$

Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level

ADDITION

- Extend to decimals with up to 2 decimal places, including:
 - ♣ sums with different numbers of digits;
 - ♣ totals of more than two numbers. e.g. $76.56 + 312.2 + 5.07 = 398.83$
- Use compensation by adding too much, and then compensating

SUBTRACTION GUIDELINES

- Year One Year Two Year Three - = signs and missing numbers $7 - 3 = \quad = 7 - 3$ $7 - \quad = 4$ $4 = \quad - 3$ $\quad - 3 = 4$ $4 = 7 - \quad$ $\quad - \nabla = 4$ $4 = \quad - \nabla$
- Understand subtraction as 'take away'
- Find a 'difference' by counting up; I have saved 5p. The socks that I want to buy cost 11p. How much more do I need in order to buy the socks?
- Use practical and informal written methods to support the subtraction of a one-digit number from a one digit or two-digit number and a multiple of 10 from a two digit number. I have 11 toy cars. There are 5 cars too many to fit in the garage. How many cars fit in the garage? -5
- Use the vocabulary related to addition and subtraction and symbols to describe and record addition and subtraction number sentences

- = signs and missing numbers

- Continue using a range of equations as in Year 1 but with appropriate numbers.
- Extend to $14 + 5 = 20$ - Find a small difference by counting up $42 - 39 = 3$ Subtract 9 or 11. Begin to add/subtract 19 or 21 $35 - 9 = 26$
- Use known number facts and place value to subtract (partition second number only) $37 - 12 = 37 - 10 - 2 = 27 - 2 = 25$ - = signs and missing numbers
- Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.
- Find a small difference by counting up
- Continue as in Year 2 but with appropriate numbers e.g. $102 - 97 = 5$ Subtract mentally a 'near multiple of 10' to or from a two-digit number
- Continue as in Year 2 but with appropriate numbers e.g. $78 - 49$ is the same as $78 - 50 + 1$ Use known number facts and place value to subtract
- Continue as in Year 2 but with appropriate numbers e.g. $97 - 15 = 72$ 82 87 $97 - 5$ -10 With practice, children will need to record less information and decide whether to count back or forward. It is useful to ask children whether counting up or back is the more efficient for calculations 0 1 2 3 4 5 6 7 8 9 10 11 $12 + 6$ 39 40 $42 + 1 + 2$ $-10 + 1$ 25 35 26 25 27 37 15 20 22 32 -10 -5 -2
- Recording by - drawing jumps on prepared lines - constructing own lines Bridge through 10 where necessary $32 - 17$ such as $57 - 12$, $86 - 77$ or $43 - 28$.
- Pencil and paper procedures Complementary addition $84 - 56 = 28$ $+20$ $+4$ $+4$ 56 60 80 84

SUBTRACTION GUIDELINES

- (- = signs and missing numbers: Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.)
- Year 4, 5 and 6 Find a small difference by counting up e.g. $5003 - 4996 = 7$
- This can be modelled on an empty number line

- Children should be encouraged to use known number facts to reduce the number of steps. Subtract the nearest multiple of 10, then adjust.
- Continue as in Year 2 and 3 but with appropriate numbers.
- Use known number facts and place value to subtract $92 - 25 = 67$

Pencil and paper procedures

- Complementary addition $754 - 86 = 668$
- For those children with a secure mental image of the number line they could record the jumps only: $754 - 86 = 668$
- Find a difference by counting up e.g. $8006 - 2993 = 5013$
- This can be modelled on an empty number line.
- Subtract the nearest multiple of 10 or 100, then adjust.
- Continue as in Year 2, 3 and 4 but with appropriate numbers. Use known number facts and place value to subtract $6.1 - 2.4 = 3.7$

Pencil and paper procedures

- Complementary addition $754 - 286 = 468$ OR $754 - 286 = 468$ 14 (300) can be refined to 14 (300) 400 (700) 454 (754) 54 (754) 468
- Find a difference by counting up e.g. $8000 - 2785 = 5215$
- To make this method more efficient, the number of steps should be reduced to a minimum through children knowing:
 - ♣ Complements to 1, involving decimals to two decimal places ($0.16 + 0.84$)
 - ♣ Complements to 10, 100 and 100 Subtract the nearest multiple of 10, 100 or 1000, then adjust
- Continue as in Year 2, 3, 4 and 5 but with appropriate numbers.
- Use known number facts and place value to subtract $0.5 - 0.31 = 0.19$

Pencil and paper procedures

- Complementary addition $6467 - 2684 = 3783$ OR $6467 - 2684 = 3783$ 16 (2700) can be refined to 316 (3000) 300 (3000) 3467 (6467) 3467 (6467) 3783 3783 67 92 72 -5 -20 86 100 700 754 +14 +600 +54 3.7 6.1 4.1 -0.4 -2 286 300 700 754 +14 +400 +54 0.19 0.5 0.2 -0.01 -0.3 2684 2700 3000 6467 +16 +300 +3467 14 (100) 600 (700) 54 (754) 668 468
- Reduce the number of steps to make the calculation more efficient. Extend to 2 places of decimals Reduce the number of steps to make the calculation more efficient. Extend to 2 places of decimals

Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level

SUBTRACTION

Mental methods

- Use compensation by subtracting too much, and then compensating Use jottings such as an empty number line to support or explain methods for adding mentally. Pencil and paper procedures (Written methods)
- Subtract more complicated fractions For Example: Extend to decimals with up to 2 decimal places, including:
 - ♣ differences with different numbers of digits #
 - ♣ totals of more than two numbers.
- Complementary addition

MULTIPLICATION GUIDELINES

Year 1, 2 and 3

- Multiplication is related to doubling and counting groups of the same size. Looking at columns Looking at rows $2 + 2 + 2$ $3 + 3 + 3$ groups of 2 2 groups of 3
- Counting using a variety of practical resources
- Counting in 2s e.g. counting socks, shoes, animal's legs...
- Counting in 5s e.g. counting fingers, fingers in gloves, toes...
- Counting in 10s e.g. fingers, toes...
- Pictures / marks There are 3 sweets in one bag. How many sweets are there in 5 bags?
- \times = signs and missing numbers $7 \times 2 = \quad = 2 \times 7$ $7 \times \quad = 14$ $14 = \quad \times 7$ $\quad \times 2 = 14$ $14 = 2 \times \quad$
 $\quad \times \quad = 14$ $14 = \quad \times \quad$
- Arrays and repeated addition $\Omega \Omega \Omega \Omega$ 4×2 or $4 + 4$ $\Omega \Omega \Omega \Omega$ 2×4 or $2 + 2 + 2 + 2$
- Doubling multiples of 5 up to 50 $15 \times 2 = 30$

Partitioning

- Children need to be secure with partitioning numbers into 10s and 1s and partitioning in different ways: $6 = 5 + 1$ so e.g. Double 6 is the same as double five add double one. AND double 15 $10 + 5$ $20 + 10 = 30$ OR $\times 10$ 5×2 20 $10 = 30$
- \times = signs and missing numbers
- Continue using a range of equations as in Year 2 but with appropriate numbers.
- Arrays and repeated addition
- Continue to understand multiplication as repeated addition and continue to use arrays (as in Year 2).
- Doubling multiples of 5 up to 50 $35 \times 2 = 70$
- Partition $\times 30$ 5×2 60 $10 = 70$
- Use known facts and place value to carry out simple multiplications
- Use the same method as above (partitioning), e.g. $32 \times 3 = 96 = 96$ 0 1 2 3 4 5 6 7 8 x
30 2 3 90 6

MULTIPLICATION GUIDELINES

Year 4,5 and 6

- $x =$ signs and missing numbers
- Continue using a range of equations as in Year 2 but with appropriate numbers
- Partition Continue to use arrays: $18 \times 9 = 162$ $18 \times 9 = (10 \times 9) + (8 \times 9) = 162$
- OR Use the grid method of multiplication
- Pencil and paper procedures
- Grid method 23×7 is approximately $20 \times 10 = 200$ $20 \times 3 = 60$ $23 \times 7 = 161$
- Partition $47 \times 6 = 282$ $47 \times 6 = (40 \times 6) + (7 \times 6) = 282$
- OR Use the grid method of multiplication

Pencil and paper procedures

- Grid method 72×38 is approximately $70 \times 40 = 2800$ $2100 + 60 = 2160$ $560 + 16 = 576$ $2160 + 560 + 2736$
- Expanded Column Multiplication
- Children should describe what they do by referring to the actual values of the digits in the columns. For example, the first step in 38×7 is 'thirty multiplied by seven', not 'three times seven', although the relationship 3×7 should be stressed. $30 \times 7 = 210$ $8 \times 7 = 56$ $210 + 56 = 266$
- Partition $87 \times 6 = 522$ $87 \times 6 = (80 \times 6) + (7 \times 6) = 522$
- OR Use the grid method of multiplication

Pencil and paper procedures

- Grid method 372×24 is approximately $400 \times 20 = 8000$
- Extend to decimals with up to two decimal places.
- Short Column Multiplication
- The recording is reduced further, with carry digits recorded below the line. $38 \times 7 = 266$ 5
- Children who are already secure with multiplication for $TU \times U$ and $TU \times TU$ should have little difficulty in using the same method for $HTU \times TU$ or applying decimals. $286 \times 29 = 2574$ ($9 \times 286 = 2574$) 5720 ($20 \times 286 = 5720$) 8294 $1 \times 70 = 70$ 230 2100 608 560 16

Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level

MULTIPLICATION

- Mental methods Use partitioning Partition either part of the product e.g. $7.3 \times 11 = (7.3 \times 10) + 7.3 = 80.3$
- OR Use the grid method of multiplication

Pencil and paper procedures (Written methods)

- Use written methods to support, record or explain multiplication of:
- a three-digit number by a two-digit number
- a decimal with one or two decimal places by a single digit
- Grid method 6.24×8 is approximately $6 \times 8 = 48 = 49.92$
- Grid lines can become optional $\times 6 \ 0.2 \ 0.04 \ 8 \ 48 \ 1.6 \ 0.32$

DIVISION GUIDELINES

Year 1, 2 and 3

- Sharing requires secure counting skills -see counting and understanding number strand
- Develops importance of one-to-one correspondence
- Sharing – 6 sweets are shared between 2 people.
- How many do they have each?
- Practical activities involving sharing
- Distributing cards when playing a game,
- Putting objects onto plates, into cups, hoops etc.

Grouping

- Sorting objects into 2s / 3s/ 4s etc
- How many pairs of socks are there?
- There are 12 crocus bulbs. Plant 3 in each pot. How many pots are there?
- Jo has 12 Lego wheels. How many cars can she make? $\div =$ signs and missing numbers
 $6 \div 2 = \quad = 6 \div 2 \ 6 \div = 3 \ 3 = 6 \div \quad \div 2 = 3 \ 3 = \quad \div 2 \quad \div \nabla = 3 \ 3 = \quad \div \nabla$
- Link to counting and understanding number strand
- Count up to 100 objects by grouping them and counting in tens, fives or twos;...
- Find one half, one quarter and three quarters of shapes and sets of objects $6 \div 2$ can be modelled as: There are 6 strawberries. How many people can have 2 each?
- How many 2s make 6? $6 \div 2$ can be modelled as: In the context of money count forwards and backwards using 2p, 5p and 10p coins
- Practical grouping e.g. in PE 12 children get into teams of 4 to play a game. How many teams are there?
- $\div =$ signs and missing numbers
- Continue using a range of equations as in Year 2 but with appropriate numbers.
- Understand division as sharing and grouping $18 \div 3$ can be modelled as: Sharing – 18 shared between 3 (see Year 1 diagram)
- OR Grouping - How many 3's make 18? 0 3 6 9 12 15 18
- Remainders $16 \div 3 = 5 \ r1$ Sharing - 16 shared between 3, how many left over?
- How many 3's make 16, how many left over? e.g. 0 3 6 9 12 15 16 0 1 2 3 4 5 6

Division Guidelines

Year 4, 5 and 6

- \div = signs and missing numbers
- Continue using a range of equations as in Year 2 but with appropriate numbers.
- Sharing and grouping $30 \div 6$ can be modelled as: grouping – groups of 6 placed on no. line and the number of groups counted e.g. sharing – sharing among 6, the number given to each person
- Remainders $41 \div 4 = 10 \text{ r}1$ $41 = (10 \times 4) + 1$ Pencil and paper procedures- Chunking. $72 \div 5$ lies between $50 \div 5 = 10$ and $100 \div 5 = 20$
- Partition the dividend into multiples of the divisor: e.g. $72 = 50 + 22$ $50 \div 5 = 10$ $22 \div 5 = 4 \text{ r}2 \rightarrow 10 + 4 \text{ r}2 = 14 \text{ r}2$ OR $72 - 50$ (10 groups) $22 - 20$ (4 groups) 2 Answer : 14 remainder 2
- Sharing and grouping
- Continue to understand division as both sharing and grouping (repeated subtraction).
- Remainders Quotients expressed as fractions or decimal fractions $61 \div 4 = 15 \frac{1}{4}$ or 15.25

Pencil and paper procedures

- Chunking $256 \div 7$ lies between $210 \div 7 = 30$ and $280 \div 7 = 40$
- Partition the dividend into multiples of the divisor: e.g. $256 = 210 + 46$ $210 \div 7 = 30$ $46 \div 7 = 6 \text{ r}4 \rightarrow 30 + 6 \text{ r}4 = 36 \text{ r}4$ OR $256 - 210$ (30 groups) $46 - 42$ (6 groups) 4 Answer: 36 remainder 4
- Short Division for More Able Children
- Sharing, grouping and remainders as Year Five Pencil and paper procedures-
- Chunking $977 \div 36$ is approximately $1000 \div 40 = 25$
- Partition the dividend into multiples of the divisor: e.g. $977 = 720 + 180 + 77$ $720 \div 36 = 20$ $180 \div 36 = 5$ $77 \div 36 = 2 \text{ r}5 \rightarrow 20 + 5 + 2 \text{ r}5 = 27 \text{ r}5$ OR $977 - 720$ (20 groups) $257 - 180$ (5 groups) $77 - 72$ (2 groups) 5 Answer: 27 5 /36

Pencil and Paper procedures- Short Division Method

Write down how many times your divisor goes into the first number of the dividend. If there is a remainder, that's okay. Write down your remainder to the left of the next digit in the dividend. Continue. Repeat steps 1-3 until you are done. Both methods above are necessary at this stage, to deal with the wide range of problems experienced at Year Six. $+6 +6 +6 +6 +6$ 0 6 12 18 24 30 +1 +40 10 groups +40 +1 10 groups 5 groups +20

SEND and Inclusion

There are children of differing abilities in all classes at St Charles RC Primary School. We provide suitable learning opportunities for all children by matching the challenge of the task to the ability of the child.

We identify which pupils or groups of pupils are under-achieving and take steps to improve their attainment.

Gifted children will be identified and suitable learning challenges provided. We achieve this through a range of strategies. In some lessons we do it through differentiated group work, while in other lessons we ask children to work from the same starting point before moving on to develop their own ideas.

We use teaching assistants to support some children and to enable work to be matched to the needs of individuals. Work in Mathematics takes into account the targets set for individual children in their Individual Education Plans (IEPs).

Teachers provide help with communication and mathematics through:

- using visual aids such as number lines, 100 grids, calculators and Numicon;
- using visual and written materials in different formats;
- using I.C.T., other technological aids and recorded materials;
- using alternative communication such as signs and symbols;
- using translators and amanuenses.

Equal Opportunities

St Charles RC Primary School has universal ambitions for every child, whatever their background or circumstances. Children learn and thrive when they are healthy, safe and engaged. In order to engage all children, cultural diversity, home languages, gender and religious beliefs are all celebrated.

We believe in 'valuing what the child brings to school' and recognise the importance of supporting a child's first language, not only to foster self-esteem, but to assist in the learning of English.