# Staplegrove Church School 



## Calculation Policy for Mathematics

(Adapted from Capturing Maths)


This policy has been designed to teach children through the use of concrete, pictorial and abstract methods. This calculation policy should be used to support children to develop a deep understanding of number and calculation.

## Background

This policy has been created to develop number awareness and fluency for our children. The policy only details the strategies; teachers must plan opportunities for pupils to apply these; for example, when solving problems, or where opportunities emerge elsewhere in the curriculum.

## Using the concrete-pictorial-abstract approach

Children develop an understanding of a mathematical concept through the three steps (or representation) of concrete-pictorial-abstract approach. Reinforcement is achieved by going back and forth between these representations.

## Concrete representation

The enactive stage - a pupil is first introduced to an idea or a skill by acting it out with real objects. This is a 'hands on' component using real objects and it is the foundation for conceptual understanding.

## Pictorial representation

The iconic stage - 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.

## Abstract representation

The symbolic stage - a pupil is now capable of representing problems by using mathematical notation, for example: $12 \div 2=6$.


## Reception Addition

## Explore part - part - whole relationship



Using the calculation frame to support addition of single digits counting all/combining two groups


Solving addition problems using concrete and pictorial images to include finding one more.


## Reception Subtraction

Continue to explore the part - part - whole relationship
Solving subtraction problems using concrete and pictorial images to include finding one less.

Taking away after counting out practical equipment. Children would be encouraged to physically remove these using touch counting.


By touch counting and dragging in this way, it allows children to keep track of how many they are removing so they don't have to keep recounting. They will then touch count the amount that are left to find the answer.

Those who are ready may record their own calculations


> Peter has 5 pencils and 3 erasers. How many more pencils than erasers does he have?

## Reception Multiplication



Children will experience equal groups of objects.
They will work on practical problem solving activities involving


There are 6 pairs of socks. How many socks are there altogether?

## Reception Division



Children use concrete resources to share equally and fairly in practical situations.

| Year 1 Addition |  |
| :---: | :---: |
| Joining two groups and then recounting all objects using one-to-one correspondence (lots of practice making 10 and numbers to 10 e.g. $6+4=10$ or $3+5=$ 8) |  |
| Learn number bonds to 20 and demonstrate related facts Teach addition and subtraction alongside each other as pupils need to see the relationship between the facts Know that addition is commutative |  $\begin{aligned} & 8+4=12 \\ & 4+8=12 \end{aligned}$ <br> This is a family of addition and subtraction facts. <br> $12-8=4$ $12-4=8$ |
| Add and subtract one digit numbers and two digit numbers to 20 , including zero |  |
| Bridging 10 <br> Use ten frames, Singapore bars, egg boxes and number lines to practice. <br> Chn should start with the larger number and add the smaller number seeing what makes ten and what is left over or use known number facts | $6+6=12$ <br> Make 9 in one and 3 in the other. Take one from the 3 to make the 9 into ten.... $10+2=12$ |

## Year 1 Subtraction

Taking away should
begin with physical
objects: objects, cubes,
Dienes etc

| When subtracting using Dienes children should be taught to regroup a ten rod for 10 ones and then subtract from those ones | $20-4=16 \text { and } 20-\square=16$ |
| :---: | :---: |
| Subtracting multiples of 10 <br> Using the vocabulary of 1 ten, 2 tens etc alongside 10, 20, 30 Is very important here as pupils need to understand that it is a 10 not a 1 that is being taken away |  |
| Use a 100 square to show that when subtracting 10 the ones numbers stays the same. Consolidate that children no longer count along the rows. |  $26-10=16$ |


| Year 1 Multiplication |  |
| :---: | :---: |
| Counting in multiples of <br> 2,5 and 10 from zero <br> Children should count the number of groups on their fingers as they are skip counting. <br> Use concrete arrays | (2) (4) (6) 8 <br> 4 groups of $2=8$ |
| When moving to pictorial/written calculations the vocabulary is important | This image represents two groups of 4 or 4 twice |
| Solving multiplication problems using repeated addition |  |
| Year 1 Division |  |
| Pupils should be taught to divide through working practically and the sharing should be shown below the whole to familiarize children with the concept of the whole <br> The language of whole and part part should be used | $10 \div 2=5$ <br> 1) There are 8 cans. <br>  |

## Year 2 Addition

Children should be able to add some numbers mentally using jottings, number lines and other methods. Below is a guideline to the only formal methods that should be used in this year group.

| Using concrete |
| :--- |
| objects and |
| pictorial |
| representations |
| to add a 2-digit |
| number with a |
| digit number |



## Year 2 Subtraction

Children should be able to subtract some numbers mentally using jottings, number lines and other methods. Below is a guideline to the only formal methods that should be used in this year group.

| Use a number line to count back subtracting ones first | Use number lines as appropriate, focussing on subtracting ones first to make the link between this method and more formal ones. |
| :---: | :---: |
| Using concrete objects and pictorial representations to subtract a 1 digit number from 2 digit number | Subtract the ones. <br> 8 ones -3 ones $=5$ ones |
| Using concrete objects and pictorial representations to subtract a 10 s number from 2 digit number | Subtract the tens <br> 3 tens -2 tens $=1$ ten <br> $36-20=16$ |
| Using concrete objects and pictorial representations to subtract a 2 digit number from 2 digit number |  |
| Recognise and use the inverse relationship between addition and subtraction | $?$  <br> 23 5376  <br> 23 $?$ <br> Use this to check calculations and solve missing number problems. |
| Use counting on to find the difference | What is the difference between 26 and 29? <br> Count on to find the answer. <br> $29-26=3$ |

## Year 2 Multiplication

Skip counting in
multiples
of $2,3,5,10$ from
0



## Year 3 Addition



## Year 3 Subtraction

| Subtract up to 3 digits from 3 digits. <br> Very important for children to use dienes equipment along with a place value chart to support. | Only when secure with the method should compact or exchanging be introduced. <br> Subtract the ones <br> 5 ones -3 ones $=2$ ones <br> Subtract the tens. <br> 7 tens -2 tens $=5$ tens <br>  <br> 9 hundreds -7 hundreds $=2$ hundreds $530-219=311$ $\begin{aligned} & 975-723=252 \\ & 900705 \\ & -\frac{700203}{200502} \end{aligned}$ $\begin{aligned} & 975-723=252 \\ & 975 \\ & -\frac{723}{252} \end{aligned}$ $530-219=311$ |
| :---: | :---: |
| Using the bar to find missing digits. <br> It is important for children to use the bar in this way to encourage the use of it to aid with problem-solving. |  |

## Year 3 Multiplication



## Year 3 Division

| Dividing by grouping understanding the concept of remainders. | Start with using the real objects or objects that represent the calculation; moving on to demonstrating on a number line from 0. |
| :---: | :---: |
| Dividing using short division. <br> Once children are secure with division as grouping and demonstrate this using number lines, arrays etc., short division for larger 2-digit numbers should be introduced, initially with carefully selected examples requiring no calculating of remainders at all. Start by introducing the layout of short division by comparing it to an array. |  <br> Remind children of correct place value, that 69 is equal to 60 and 9, but in short division, pose: <br> How many $3 s$ in $6 ?=2$, and record it above the 6 tens. How many $3 s$ in $9 ?=3$, and record it above the 9 ones. <br> Once children demonstrate a full understanding of remainders, and also the short division method taught, they can be taught how to use the method when remainders occur within the calculation (e.g. 72 $\div 3$ ), and be taught to 'carry' the remainder onto the next digit. |
| Using the bar to aid the solving of division problems. | Four children bought a present for £28. They shared the costs equally. How much did each child pay? |

## Year 4 Addition



## Year 4 Subtraction

| To subtract with numbers up to four digits including exchanging when children are secure. <br> Again children need to use Dienes to support their learning. |  | Subtract the ones. <br> 7 ones -6 ones $=1$ one <br> Subtract the tens. <br> 3 tens -1 ten $=2$ tens <br> Subtract the hundreds. <br> 4 hundreds -0 hundreds $=4$ hundreds <br> Subtract the thousands. <br> 3 thousands -2 thousands $=1$ thousand | $(1000)$ 1000 100 10 10 <br>      <br> $(1000)$  10   <br> $(000)$  10 10 $\left.\begin{array}{\|l\|l\|ll\|ll\|}\hline+1000) & 1000 & 100 & 10 & 10 & 1 \\ \hline\end{array}\right)$ | There aren't enough ones. $\begin{array}{r} 52710 \\ -\quad 3169 \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: | :---: |
| Using the bar to find missing digits. <br> It is important for children to use the bar in this way to encourage the use of it to aid with problem-solving. |  | There are 3,160 books the rest are in French. | a shop. 1,226 are in English and . Howmany French books are there? |  |

## Year 4 Multiplication



## Year 4 Division



## Year 5 Addition



## Year 5 Subtraction



## Year 5 Multiplication

|  |
| :--- |
| Multiplying up to four |
| digit numbers by two |
| digits using long |
| multiplication. |
|  |
| Children need to be |
| taught to approximate |
| first, e.g. for $\mathbf{7 2} \times \mathbf{3 8}$, |
| they will use rounding: |
| $\mathbf{7 2 \times 3 8}$ is approximately |
| $\mathbf{7 0 \times 4 0}=\mathbf{2 8 0 0}$, and use |
| the approximation to |
| check the |
| reasonableness of their |
| answer. |

Explain that first we are multiplying the top number by 7 starting with the ones (any carrying needs to be done underneath the numbers).
Now explain that we need to put a 0 underneath (this is because we are multiplying the number by 20 or 2 tens which is the same as multiplying 10 by 2)
Now add the 2 numbers together to give you the answer.
This will need repeated modelling.


Using the bar to support multiplication.

The cost to run a sports centre is $£ 4375$ a week, how much would it cost to run for 16 weeks?


## Year 5 Division

Diving with up to fourdigit numbers by onedigit including numbers where remainders are left.

Using the bar to support division problems.


Short division with remainders: Now that pupils are introduced to examples that give rise to remainder answers, division needs to have a real life problem solving context, where pupils consider the meaning of the remainder and how to express it, ie. as a fraction, a decimal, or as a rounded number or value, depending upon the context of the problem.
Bar Model to support understanding of problem solving:
Frank has 4920 apples. He needs to put them into baskets of 40 . How many
baskets does he need?


## Year 6 Addition



## Year 6 Subtraction



## Year 6 Multiplication



## Year 6 Division

| Divide at least 4 digits by both single-digit and 2-digit numbers (including decimal numbers and quantities) | Short division with remainders: Pupils should continue to use this method, but with numbers to at least 4 digits, and understand how to express remainders as fractions, decimals, whole number remainders, or rounded numbers. Real-life problem solving contexts need to be the starting point, where pupils have to consider the most appropriate way to express the remainder. |
| :---: | :---: |
| Short division for when dividing by two-digit numbers. |  |
| Using the bar to help divide. | Paul and David hire a car together at a cost of $£ 297.50$. Paul pays 6 times more than David. How much does David pay? |

