Christ Church CE Primary School – Calculations Policy

This policy outlines the key calculation strategies taught in each year group, and is a useful point of reference for parents and carers to understand the end-points for each year's learning, and for teachers to see at a glance which methods and approaches children should have mastered in the previous year group. They reference the most important representations and strategies. It can be useful when supporting children with their learning at home.

It does not show *how* calculation methods are taught; nor does it cover all strategies and expectations for each year group. In general, approaches are taught using the concrete-pictorial-abstract approach, giving children a chance to 'get their hands on' the Maths before applying their understanding in abstract contexts.

This policy contains simple examples of the concepts and methods taught, so that it can be easily understood. In the classroom, children apply these strategies to explore and solve more complex and unfamiliar problems.

Our learning journey - Addition and subtraction

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
In EYFS, we learn to **subitise** small amounts and explore **composition of numbers**: the idea that smaller numbers can be found inside larger numbers (eg inside 5 is a 3 and a 2). We learn some of the ways that small numbers can be composed of other numbers.	Our understanding of **composition** is developed through number and shape work. We understand addition and subtraction as 'putting together' (**aggregation**) and 'taking apart' (**partitioning**) stories and as 'first, then, now' stories (**augmentation** and **reduction**). We write and solve equations to match these stories. We learn and practise addition and subtraction facts for numbers to 10.	We apply our number facts to calculations within 20, including adding together three numbers. We learn and practise strategies for calculations within 20, and understand subtraction as **difference**. We build on our fluency in number facts to add and subtract a one-digit number to and from any two-digit number; any multiple of ten to and from a two-digit number; and any two two-digit numbers.	We learn and apply a range of mental calculation methods including adjusting and redistributing, We learn to apply our number facts within 20 to the formal column addition method and apply known mental strategies to check our answers. We also learn column subtraction, again using mental strategies to check our answers.	We review column addition and subtraction of 3-digit numbers and apply our new understanding of larger numbers to the column methods. When learning about the place-value of 4-digit numbers we consider and compare known strategies for addition and subtraction.	We extend our understanding of column addition and subtraction to decimal numbers and measures. We practise the mental methods of adjusting, redistribution, partitioning and finding the difference.	We revisit the mental and written methods for addition and subtraction taught and practised so far and apply these to increasingly complex problems. We learn the 'same sum' and 'same difference' strategies for mental calculations and use them when solving problems in a range of contexts.

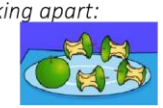
Subitising: 'don't count, say the amount!'

Composition: 'Five is made of two and three; two and three make five'

Addition and subtraction stories:

Putting together:

Taking apart:



First, then, now:

Writing addition and subtraction equations:

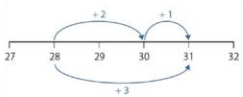
$1+3=4$ $3+1=4$

$4=1+3$ $4=3+1$

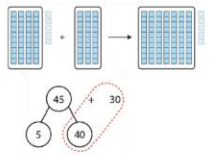
$4-1=3$ $4-3=1$

$3=4-1$ $1=4-3$

Add/subtract a 1-digit number:



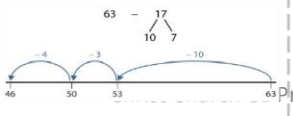
Add/subtract a multiple of ten:



Add/subtract any two-digit numbers by **partitioning**:

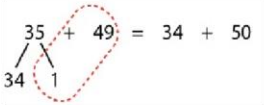
$47 + 36 = 70 + 13 = 83$

$40\ 7 \quad 30\ 6$



Adjusting:

Redistribution:



Column addition and subtraction:

789 + 642 becomes

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

932 − 457 becomes

$$\begin{array}{r} 8\ \ 12\ \ 1 \\ 9\ \ 3\ \ 2 \\ -\ 4\ \ 5\ \ 7 \\ \hline 4\ \ 7\ \ 5 \end{array}$$

Column addition:

$$\begin{array}{r} 3,3\ 6\ 2 \\ +\ \ \ 6\ 4\ 9 \\ \hline 4,0\ 1\ 1 \\ 1\ 1\ 1 \end{array}$$

Column subtraction:

$$\begin{array}{r} 6,\overset{5}{\cancel{5}}\overset{14}{\cancel{3}}\overset{12}{8} \\ -\ 2,7\ 8\ 9 \\ \hline 3,7\ 4\ 9 \end{array}$$

Column addition:

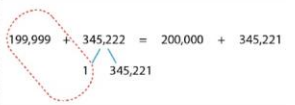
$$\begin{array}{r} 4.5 \\ +\ 3.9 \\ \hline 8.4 \\ 1 \end{array}$$

Column subtraction with decimals - using place-holder zeros:

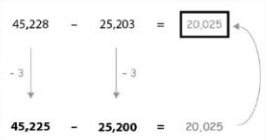
$$\begin{array}{r} 2\ 3.4 \\ -\ \ 7.6\ 2 \\ \hline \ \ \ . \end{array}$$

$$\begin{array}{r} 2\ 3.4\overset{3}{\cancel{4}}\overset{1}{0} \\ -\ \ 7.6\ 2 \\ \hline \ \ \ . \end{array}$$

Same sum:



Same difference:

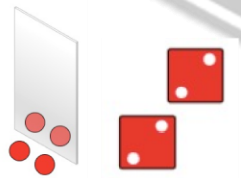


Our learning journey - Multiplication and division

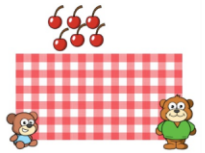
EYFS

We develop an understanding of equal and unequal groups and sharing in different everyday contexts. We explore doubles and learn the doubles of numbers to ten.

Doubling:



Sharing/grouping:

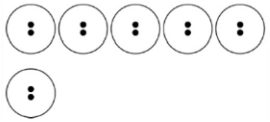


Year 1

In Year 1, we first use equal groups of objects, and then **unitise** using the context of coins, to count up in 2s, 5s, and 10s. We practise counting in 2s, 5s and 10s to become fluent.

Skip counting: objects

Skip counting: pre-money tokens



Skip-counting: coins

Year 2

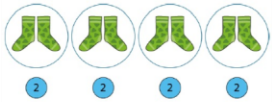
We learn that equal groups can be represented by multiplication, and we learn to use the multiplication symbol to represent equal groups. We show different multiplication contexts using written equations, including those where the group size is zero or one. We learn about division as **grouping** and solve division problems firstly by skip-counting, and then applying our knowledge of 2, 5 and 10 times tables.

Equal groups as repeated addition or multiplication:

$2 + 2 + 2 + 2 = 8$

$2 \times 4 = 8$

Division as **grouping:**



*'2, 4, 6, 8. I can make **four** groups of two from eight.'*

Using times tables to divide:

'There are three groups of ten in thirty, so thirty divided into groups of ten is three.'

$3 \times 10 = 30$

so

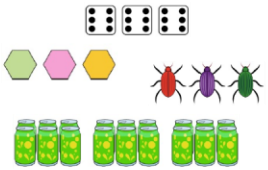
$30 \div 10 = 3$

Year 3

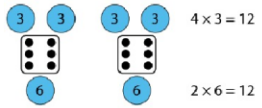
We secure our recall of the 2, 4 and 8 times tables – looking at the important connections between these – before moving on to the 3, 6 and 9 times tables, and the 7 and 11 times tables. We work hard at home and at school to memorise these times tables as they will be very important to our use of Maths in the future.

Times tables in context:

6 x 3 = 18:

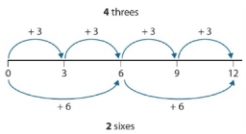


Connections between times tables:



$4 \times 3 = 12$

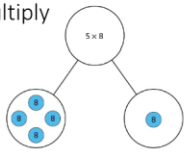
$2 \times 6 = 12$



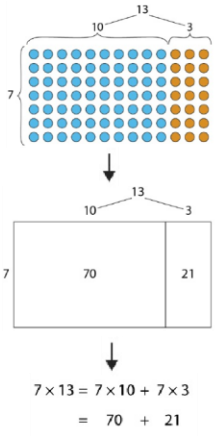
Year 4

We explore and practise the 12 times table and become fluent in all tables up to 12x12. We learn to apply the **distributive law** to solve calculations beyond known times tables and use place value to multiply and divide numbers by 10 and 100. We use mental calculations to interpret, represent and solve division stories within known times tables, with and without remainders.

Distributive law: partitioning one factor to multiply



$5 \times 8 = 4 \times 8 + 1 \times 8$



$7 \times 13 = 7 \times 10 + 7 \times 3$

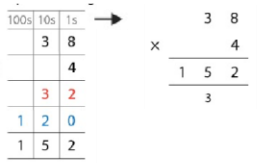
$= 70 + 21$

$= 91$

Year 5

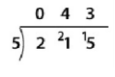
We apply the **distributive law** to learn the method of short multiplication (including for decimals), and our understanding of division with remainders to learn the method of short division. We continue to practise times tables as these are important for our work across the curriculum – for example, finding the area of a rectangle, converting units of measure, or finding equivalent fractions.

Short multiplication (expanded leading to compact layout):



Short multiplication – decimal by a whole number:

Short division:

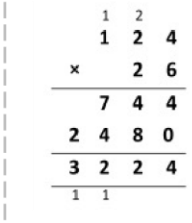


Year 6

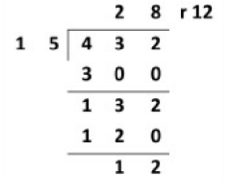
We extend the methods for multiplication and division learnt in Year 5, to now learn long multiplication and long division. In long division, we learn to give their remainder as a whole-number, decimal, or fraction and make sensible choices about when to do so.

We explore, compare and practise mental methods for multiplication and division.

Long multiplication:



Long division:



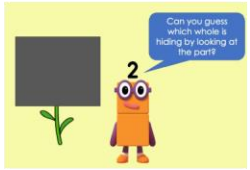
Our learning journey - Fractions

EYFS

We use practical experiences to develop an understanding of equal and unequal sharing, and of the concept of the part-whole relationship.

Equal/unequal sharing:

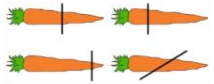
Part-whole relationship:



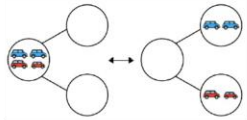
Year 1

We continue to develop our understanding of the part-whole relationship. We also learn to use the language of 'half' and 'quarter' in the context of time ('half past') and direction ('quarter-turn').

Part-whole relationship:
A whole can be split into parts in different ways:



A set can be split into parts:

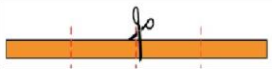


A whole can be split into more than two parts:

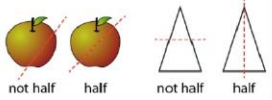
Year 2

We build on our developing understanding of division to use the language of one-half, one-quarter, and one-third in relation to a length, shape or set of objects. We then link this to the written notation for fractions. We find one-half, one-quarter and one-third of small numbers. We then link our understanding to finding three-quarters of an object, shape, length, set of objects or quantity.

Fraction of a length:



Fraction of a shape:



Fraction of a set:

Fraction of a quantity:

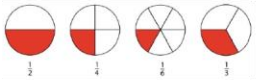
$\frac{1}{3}$ of 6

6		
2	2	2

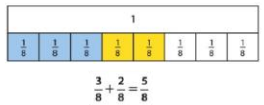
Year 3

We initially focus on **unit fractions**, learning how to identify, describe, write and compare these, and to find unit fractions of quantities. We then move on to looking at **non-unit fractions**, learning to identify, describe, write, compare, estimate, add and subtract these (all within 1).

Compare fractions:

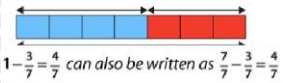


Add and subtract fractions with the same **denominator**



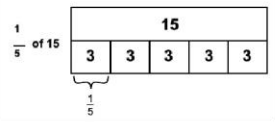
$\frac{3}{8}+\frac{2}{8}=\frac{5}{8}$

Subtracting from one:



$1-\frac{3}{7}=\frac{4}{7}$ *can also be written as* $\frac{7}{7}-\frac{3}{7}=\frac{4}{7}$

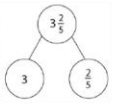
Finding a non-unit fraction of a quantity:



Year 4

We extend our understanding of fractions to express quantities greater than 1, learning to show these as **mixed numbers** and **improper fractions**. They learn to identify, describe, write, compare, estimate, add and subtract mixed numbers and improper fractions.

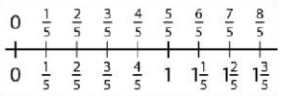
Mixed numbers:



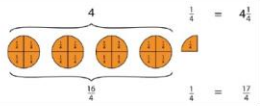
$3\frac{2}{5}=3+\frac{2}{5}$

$3+\frac{2}{5}=3\frac{2}{5}$

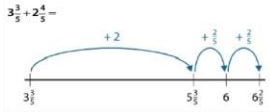
Improper fractions:



Converting between mixed numbers and improper fractions:



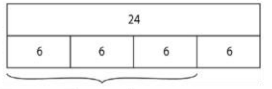
Adding and subtracting fractions greater than 1:



Year 5

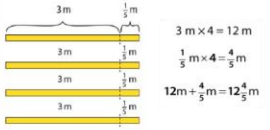
We learn to multiply whole numbers by fractions (including fractions greater than 1), and learn to find **non-unit fractions** of quantities, using mental and written methods. We explore **equivalent fractions** and develop strategies for finding equivalent fractions, and we learn some decimal-fraction equivalences.

Finding non-unit fractions of amounts:

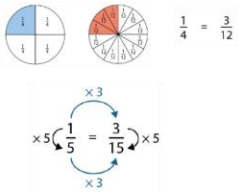


'To calculate $\frac{3}{4}\times 24$, find $\frac{1}{4}$ of 24 and then multiply by 3.'

Multiplying fractions by whole numbers:



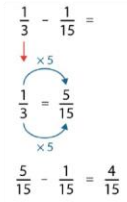
Equivalent fractions:



Year 6

We use **equivalent fractions** to **simplify** fractions and to add and subtract fractions with different denominators. We learn to use **fraction sense** as well as a **common denominator** strategy to compare fractions. We learn to multiply pairs of fractions, and divide a fraction by a whole number. We learn the meaning of the 'per cent' symbol and link percentages to decimals and fractions, before learning to find percentages of amounts.

Adding and subtracting fractions:



Multiplying pairs of fractions:

$\frac{4}{5}\times\frac{2}{3}=\frac{8}{15}$

Dividing a fraction by a whole number:

$\frac{1}{2}\div 3=\frac{1}{6}\longrightarrow\frac{1}{2}\times\frac{1}{3}=\frac{1}{6}$

Calculations policy - Glossary

ADDITION AND SUBTRACTION

Aggregation – a structure of addition that involves putting two or more quantities together

Augmentation – a structure of addition that involves increasing a quantity by adding more

Composition - Understanding that one number (shape, set, or group) can be made up from (composed from) two or more smaller numbers (shapes, sets, or groups) Difference – a structure of subtraction that involves the 'distance' or gap between two numbers

Partitioning – a structure of subtraction that involves splitting a quantity into two or more smaller parts

Reduction – a structure of subtraction that involves decreasing a quantity by taking some away

Subitise – to recognise how many things are in a group without having to count them one by one

MULTIPLICATION AND DIVISION

Distributive law - The distributive law says that multiplying a number by a group of numbers added together is the same as doing each multiplication separately. For example, 3 x 8 = 3 x 2 + 3 x 6

Quotitive – a structure of division that involves grouping a set into a given group-size, and finding the number of groups

Partitive – a structure of division that involves sharing a set into a given number of groups, and finding the group size

Unitise – to treat groups that contain, or represent, the same numbers of things as 'units' or 'ones'. (eg to see a box of 6 eggs as 'one six'

FRACTIONS

Denominator – the number written below the line in a fraction.

Improper fraction – a fraction whose numerator is greater than its denominator

Mixed number – a number greater than one expressed as a whole number and a fractional part

Non-unit fraction – a fraction that has a number other than 1 as the numerator

Numerator – the number written above the line in a fraction.

Unit fraction – a fraction that has 1 as the numerator