The Cambridge Primary School



Year 4

Calculations Policy



MAIN PRINCIPLES

What is maths mastery?

Teaching maths for mastery is a transformational approach to maths teaching which stems from high performing Asian nations such as Singapore. When taught to master maths, children develop their mathematical fluency without resorting to rote learning and are able to solve non-routine maths problems without having to memorise procedures.

Concrete, pictorial, abstract (CPA)

Concrete, pictorial, abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths. Developed by American psychologist, Jerome Bruner, the CPA approach is essential to maths teaching in Singapore.

Number bonds

Number bonds are a way of showing how numbers can be combined or split up. They are used to reflect the 'part-part-whole' relationship of numbers.

Bar modelling

The bar model method is a strategy used by children to visualise mathematical concepts and solve problems. The method is a way to represent a situation in a word problem, usually using rectangles.

Fractions

In Singapore, the understanding of fractions is rooted in the Concrete, Pictorial, Abstract (CPA) model, where children use paper squares and strips to learn the link between the concrete and the abstract. At the heart of understanding fractions is the ability to understand that we're giving an equal part a name.

PLACE VALUE

We can show the number of stickers using place-value counters.



1 thousand + 4 hundreds + 3 tens + 6 ones

thousands	hundreds	tens	ones
1	4	3	6



We can partition out numbers to represent each value.

The digit 1 has a value of 1000 or one thousand. It is in the thousands place.

The digit 4 has a value of 400 or four hundred. It is in the hundreds place.

The digit 3 has a value of 30 or thirty. It is in the tens place.

The digit 6 has a value of 6 or six. It is in the ones place.

1436 is a 4-digit number.

A number can be expressed as a sum of the values of its digits. 1436 = 1000 + 400 + 30 + 6 1000 400 30 6

We can write 1436 as one thousand, four hundred and thirty-six.

YEAR 4 PLACE VALUE

We compare four digit numbers to one another using concrete materials,

Compare the distance between London and New York, and Auckland and Sydney.

Holly used place-value counters.



The distance between London and New York is areater than the distance

When rounding and estimating number we use our place value knowledge.





YEAR 4 SUBTRACTION

When subtracting with renaming it is rooted on the understanding that there are 10 ones in 10, 10 tens in 100 etc.



- 6000 3286 = 6000 - 3000 = 3000 3000 - 200 = 2800 2800 - 80 = 2720
- 2720 6 = 2714



FURTHER MULTIPLICATION

Multiplying 3-digit by 1-digit with renaming:



218 × 4 = 872

The total mass of 4 Scotch pies is 872 g.

YEAR 4 **DIVISION**

Division in year 4 it is rooted on the deep understanding of multiplication knowledge and grouping and sharing.

Grouping

Put the children into groups of 3.



$12 \div 3 = 4$

If the children sail in groups of 3, they will use 4 sailboats.

Sharing



YEAR 4 FURTHER DIVISION

Dividing 3-digit number by 1 with renaming:

Method 1





There are 108 parcels in each delivery van.

FRACTIONS

1. Finding equal parts

Children need to understand what a fraction is. When we divide a whole into equal parts we create fractions. A fraction is just an equal part.



2. Naming equal parts

Once the children can make/identify equal parts (fractions), they need to give them a name.



3. Operations involving equal parts

If children can name a fraction, they are ready to do calculations using like fractions (they have the same name).



4. What if the parts aren't equal?

Can we add 3 apples and 2 oranges? Is it 5 apples? Is it 5 oranges? It is neither because we cannot add things with different names. We have to give them the same name, and in this case we could rename them as 'fruit'. They now all have the same name and so we can do the calculation (5 pieces of fruits). The same is true for fractions. We can't add 2 quarters and 1 eighth because they have different names, however, if we can give them the same name (equivalent) it is possible.



PROBLEM SOLVING – BAR MODELLING

The bar model method draws on the Concrete, Pictorial, Abstract (CPA) approach — an essential maths mastery concept. The process begins with pupils exploring problems via concrete objects. Pupils then progress to drawing pictorial diagrams, and then to abstract algorithms and notations (such as the +, -, x and / symbols). The example below explains how bar modelling moves from concrete maths models to pictorial representations.



As shown, the bar method is primarily pictorial. Pupils will naturally develop from handling **concrete** objects, to drawing **pictorial** representations, to creating **abstract** rectangles to illustrate a problem. With time and practice, pupils will no longer need to draw individual boxes/units. Instead, they will label one long rectangle/bar with a number. At this stage, the bars will be somewhat proportional. So, in the example above, the purple bar representing 12 cookies is longer than the orange bar representing 8 cookies.