Mathematics

Our Aims

Here at Longparish C of E primary, we are working hard to make mathematics an enjoyable and challenging subject for all pupils. We hope to promote a confident and positive attitude towards mathematics and to develop a growth mindset in the children that empowers them to attempt tasks that are challenging for them. Based on the National Curriculum and a model by the White Rose Maths Hub, we are working to give the children a high quality maths education that allows them to gain in-depth knowledge of the different areas of maths. This is done my developing the children's fluency, reasoning and problem solving ability.

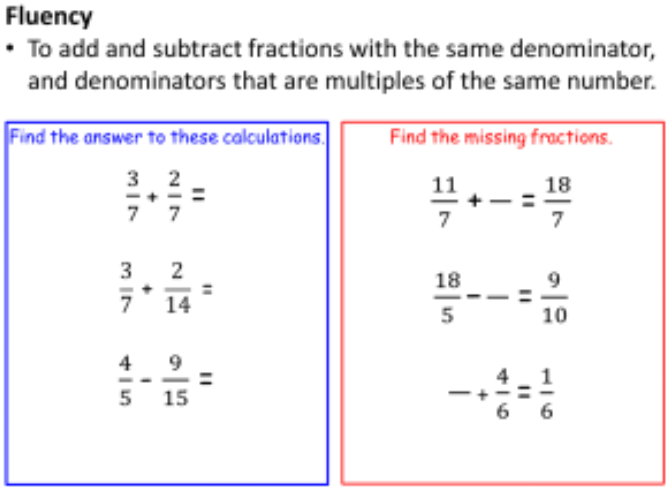
Fluency, reasoning and problem solving

'The national curriculum for mathematics aims to ensure that all pupils:

- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.'

It is important that for each mathematical area the children are given a chance to develop their fluency, reasoning and problem solving. They are three important steps in the children achieving mastery in that area. It is crucial that the children feel confident with one step before moving onto another. Therefore, teachers will base their daily maths plans on teaching these steps in the correct order, providing challenging work and opportunities to apply their understanding in a variety of different ways.

Here is an example of the national curriculum aims applied fractions:



This is the first step to the children's learning. Fluency requires them to learn strategies to complete different calculations. It requires them to learn, understand and demonstrate a variety of strategies and be able to choose the most appropriate one for the task they are attempting. They must learn to apply these strategies in a variety of contexts. The children must understand what they are doing rather than just mechanical repetition. (Third Space Learning). This is encouraged in school through the use of resources to help the children explain and show their understanding.

Reasoning

- To add and subtract fractions with the same denominator, and denominators that are multiples of the same number.

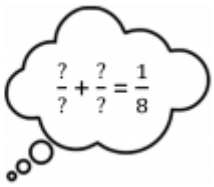
Write down two fractions which have a difference of $\frac{1}{2}$.

$\frac{?}{?} - \frac{?}{?} = \frac{1}{2}$

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

What would you say to him and why?

The answer is $\frac{1}{8}$, what is the question?



This is the second step in the children's learning. They must have gained understanding of fluency before they can start to reason. Reasoning can be thought of as the 'glue' that helps mathematics make sense (Nrich). When a child attempts a certain type of question they will have to reason which of their prior knowledge is relevant to apply to it. Reasoning can also be seen as logical thinking that is applied to answer a question. If a question has multiple starting points, the children will have to apply reasoning to decide where to start.

Problem solving

- To add and subtract fractions with the same denominator, and denominators that are multiples of the same number.

A gardener bought $\frac{2}{3}$ kg of compost on Monday and another $\frac{1}{6}$ kg on Tuesday. She filled flower pots with $\frac{1}{4}$ kg of compost. How much compost did she have left?

There were some people at a concert. $\frac{1}{5}$ of them were men and $\frac{1}{7}$ of them were women. The rest were children. What fraction of the people were children?

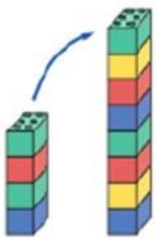
The third step in the children's learning is problem solving. They must apply their understanding in fluency and reasoning to solve mathematical problems. To be successful at problem solving, the children need to understand what the question is asking them to find out. They must then be able to identify the area of mathematics that they need to use to solve the problem and which strategies would be helpful to them. Next, they must use their reasoning to decide which strategy would be the most appropriate to apply to this context. Finally, they must use their fluency skills to complete the calculations. Problems can often contain multiple steps which must be completed in the correct order to be able to achieve an accurate answer.

<u>The Concrete-Pictorial-Abstract Approach</u>

Throughout all of this learning, teaching at Longparish is delivered using the Concrete-Pictorial-Abstract (CAP) approach. This is to help ensure the children have a deep conceptual understanding of the mathematics they are learning and not just memorising a strategy leading to a mechanical repetition. The different stages are explained below using an example of how children might learn to double from our calculation policy.

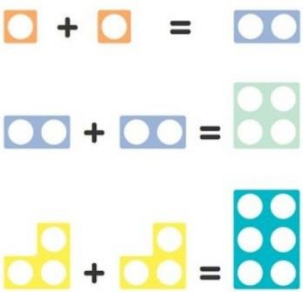
Concrete stage

The concrete stage is where the children start to learning by 'doing'. They will use a variety of physical, concrete objects to handle and manipulate to try and represent the mathematics that they are learning about. This stage is used to try to help the children understand an abstract concept.



double 4 is 8

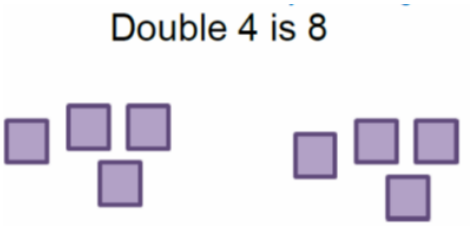
$4 \times 2 = 8$



Use practical activities using manipulatives including cubes and Numicon to demonstrate doubling.

Pictorial stage

The pictorial stage involves the children using visual representations of the physical, concrete objects they are using to solve the problem. This can be done by creating pictures, diagrams or models to show the mathematics that is being completed.



Draw pictures to show how to double numbers.

Abstract stage

The abstract stage is where the children use symbols to represent the mathematics they are completing, for example numbers, notation and mathematical symbols (+ - x ÷). It is essential that the children understand the concrete and pictorial stage before they move onto the abstract to ensure that the children have a secure understanding of the maths.

Double 4 = 8

4 + 4 = 8

4 x 2 = 8

If you are helping your children at home, please refer to our calculation policy for ideas of how to use the Concrete-Pictorial-Abstract (CAP) approach at home.

<u>Consolidating and Challenging</u>

Another important part of the curriculum is a follows: 'Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.' This is why we feel it is very important to use the Concrete-Pictorial-Abstract (CAP) approach to ensure that all children understand the mathematics they are completing and can explain how they can solve a calculation or problem. It also makes it clear that children should be challenged through reasoning and problem solving challenges, encouraging them to apply their mathematical knowledge to a wide range of contexts, ready for them to use in their adult lives.