Bar Modelling Project

Demonstrating how the use of the bar model relates to some questions on the KS1 and KS2 sample papers

Leanne Dobb and Rachel Mooney

Brookside Primary School

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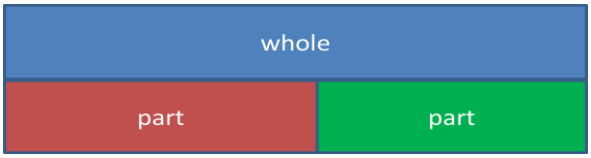
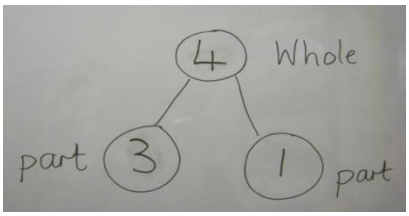
Introduction:

The National Curriculum (2014) for Mathematics focuses on fluency, reasoning and problem solvingand at Brookside Primary School, we aim to ensure that children's learning is deep and can be transferred and applied in different contexts. In this way, we aim to meet the mastery approach so that *all* pupils gain a deep understanding of mathematics.

In order to embed this in our school, we have begun to adopt the bar model approach which exposes the relationships within the structure of the mathematics. It is used to find the unknown elements in the context of part/part/whole relationships. This also supports the development of algebraic thinking.



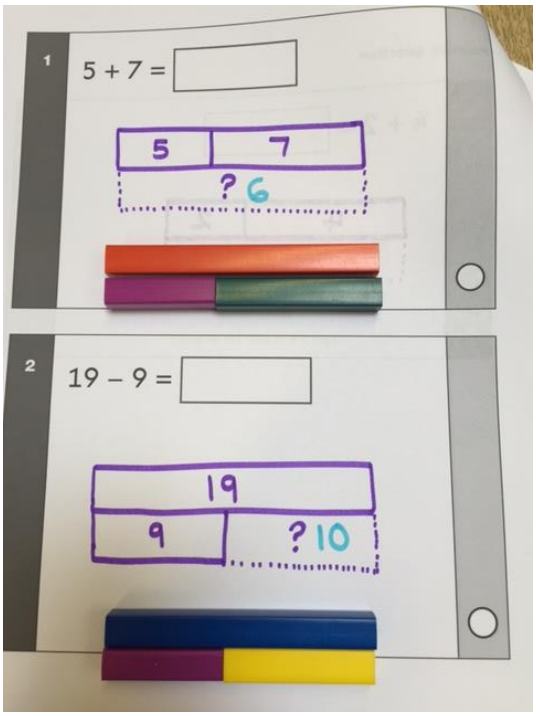
We are using this model in line with the CPA approach (concrete, pictorial, abstract) which is a progressive teaching strategy to ensure that children's learning and understanding is full of meaning. Therefore, they can apply this to different contexts and situations.

Concrete	Pictorial	Abstract
		3 + 1 = 4
		

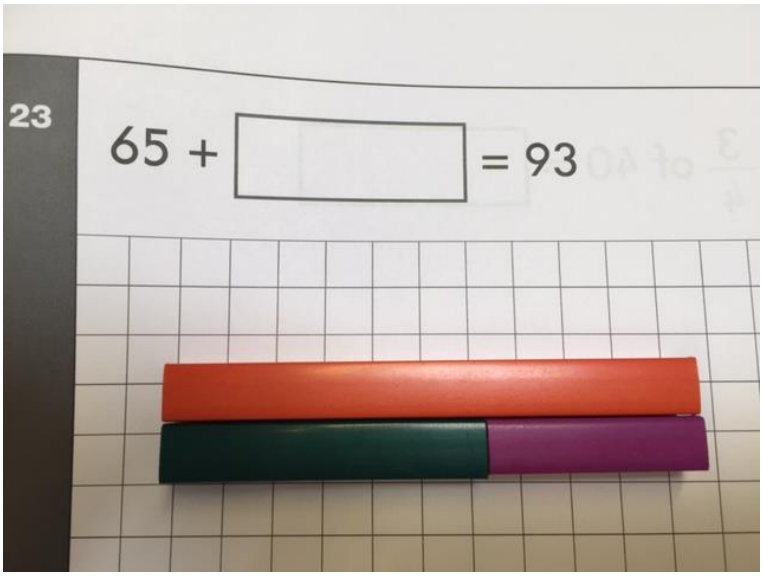
When children are given a problem or calculation, they need to identify what they know and what they don't know out of the whole and the parts. Children can use the Cuisenaire rods or draw a bar model to help them understand what operation is required for the problem. The model can also be a good way to represent and explore the relationships between inverse operations.

KS1 SATS Sample Papers

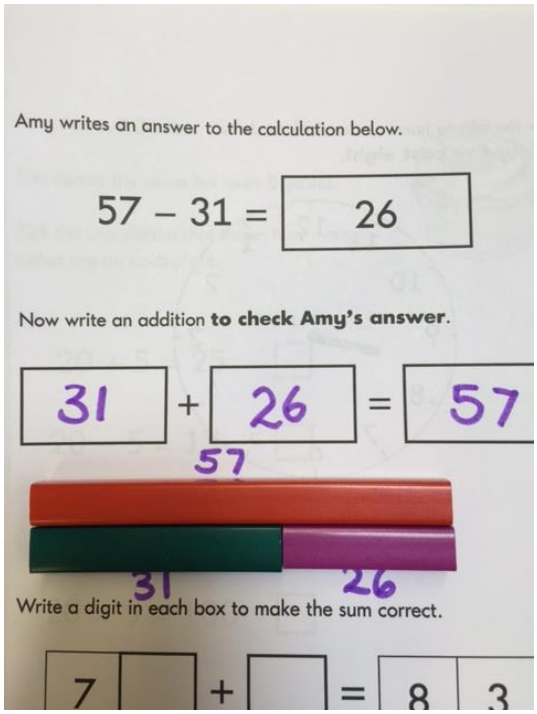
In addition and subtraction problems, the part/whole relationship is very clear through the use of rods or bar model images. This can be used effectively to explore inverse operation.



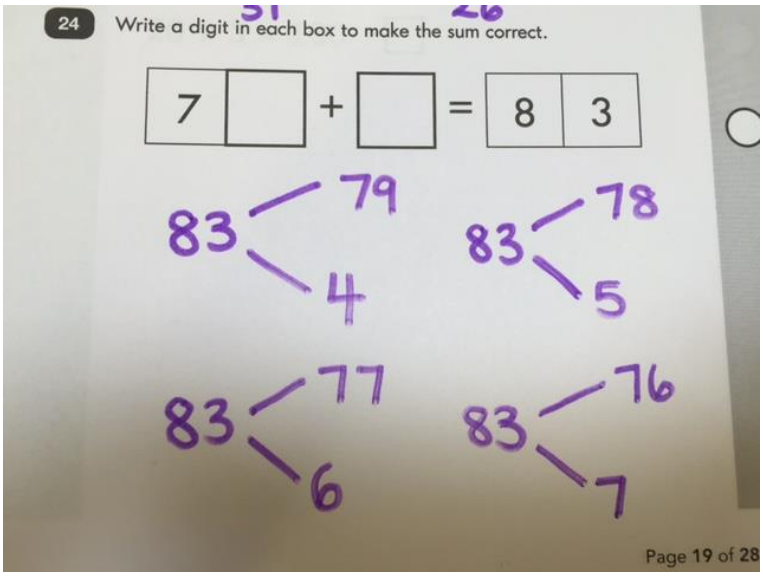
This can then be applied to support children to understand missing number calculations which is an area that our child have previously found difficult.



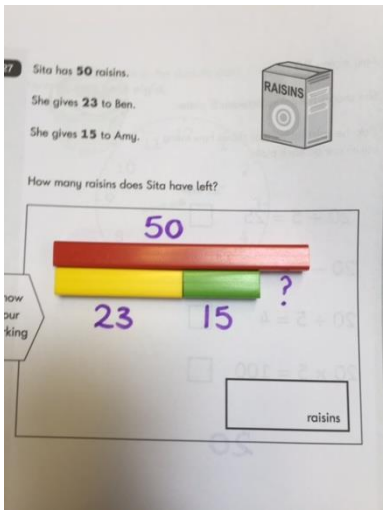
By using a bar model to represent the original number sentence, the inverse operation is clear to see using the part/whole relationship.

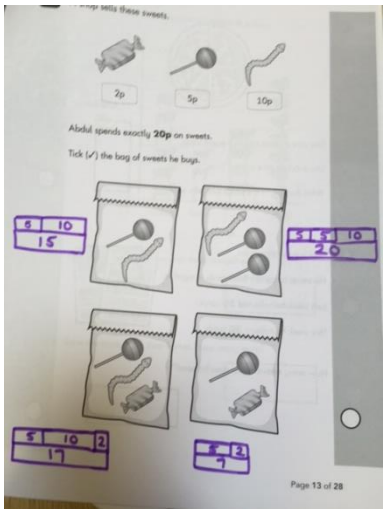


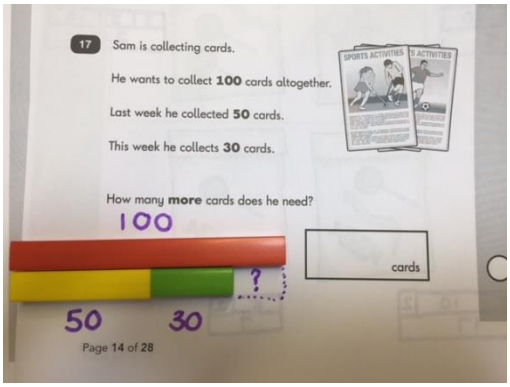
The cherry model is another way to represent numbers and can be effective for number bonds using any number. It gives children the opportunity to see relationships between numbers and identify patterns.



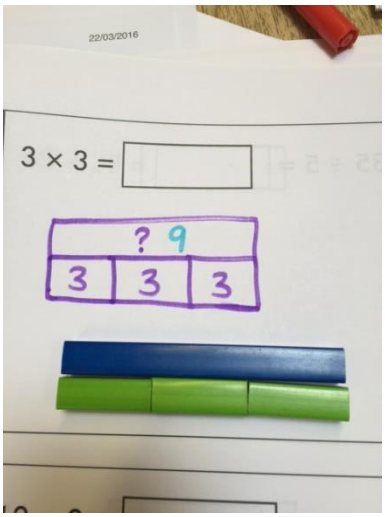
These bar models have been used for addition and subtraction word problems. First, children are required to think about what they know (and whether this is a part or a whole) to decide what they need to find out.

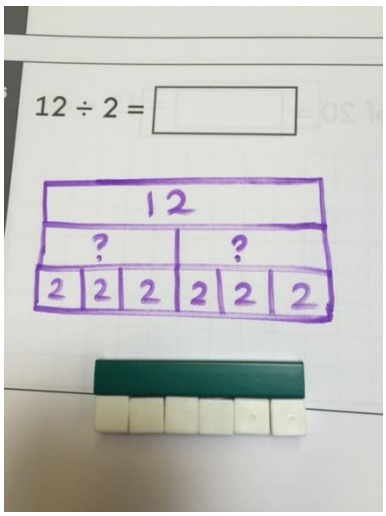




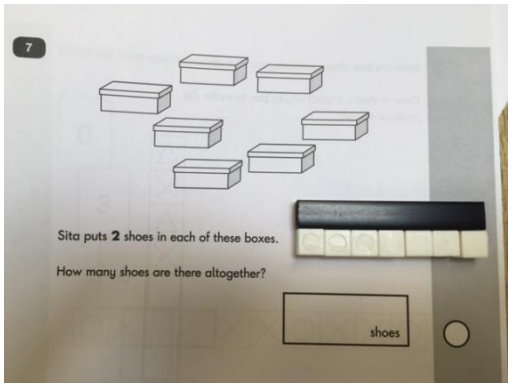


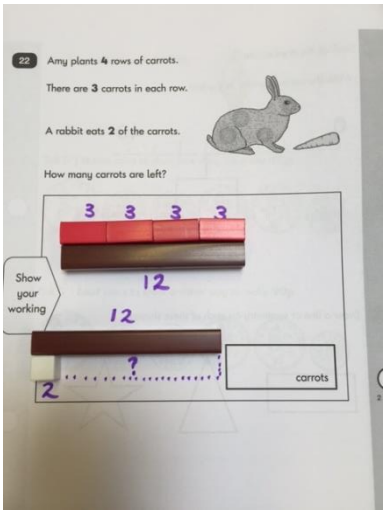
The bar models in these questions represent multiplication and division number sentences. The division number sentence shows how bar models can be used to represent a number sentence in more than one way.



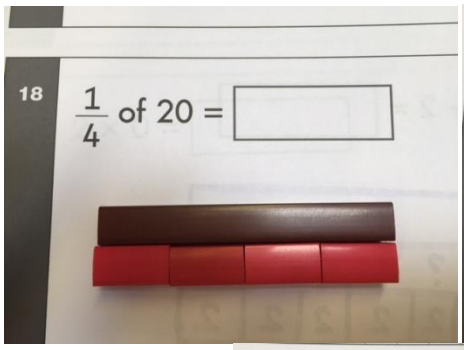


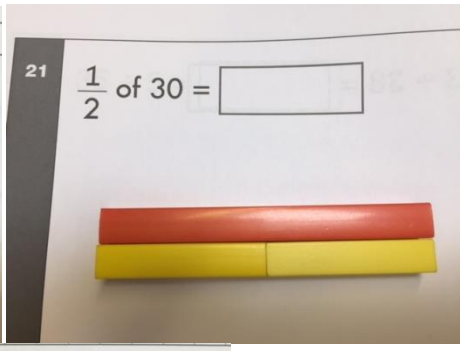
By using a bar model to represent these word problems, the unknown element is clear and it helps children to make sense of what calculation they need to solve the problem. This is particularly apparent in the second problem which involves two steps for multiplication and subtraction.

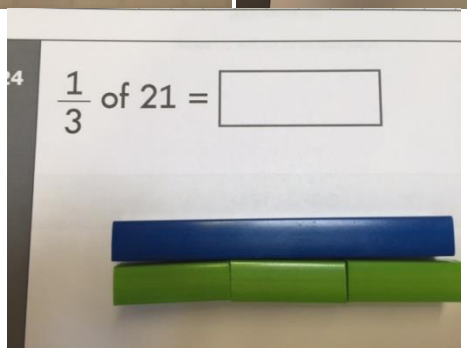




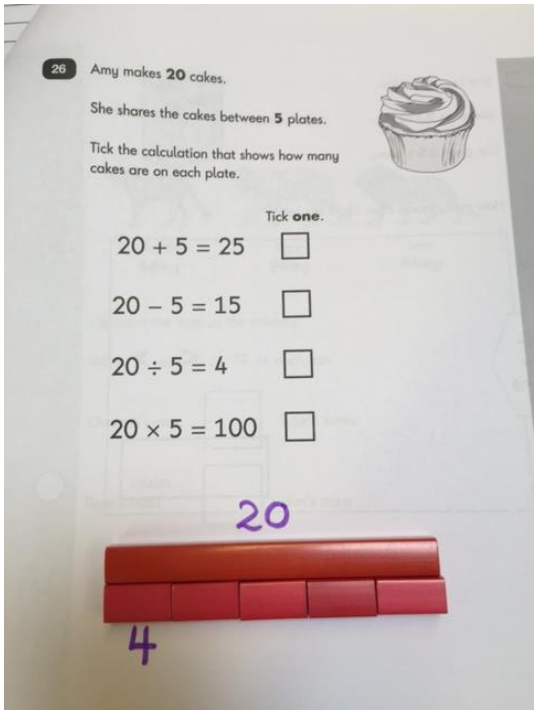
These questions show how bar models and Cuisenaire rods can be used to represent the part/whole relationships in fractions.





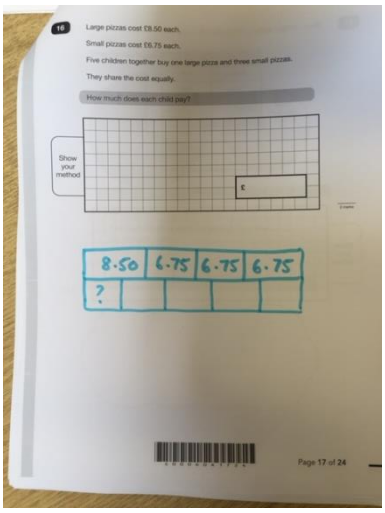


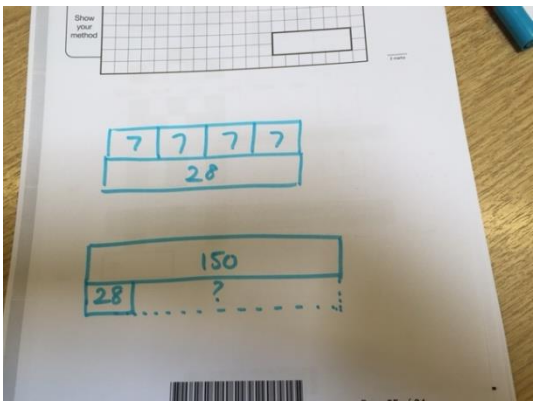
Overall, the bar models used for KS1 are relatively simple comparison models which help the children to visualise the mathematics involved and ensure they have a deep understanding of the problem. This final picture shows how the bar model makes it much clearer as to which number sentence is correct.



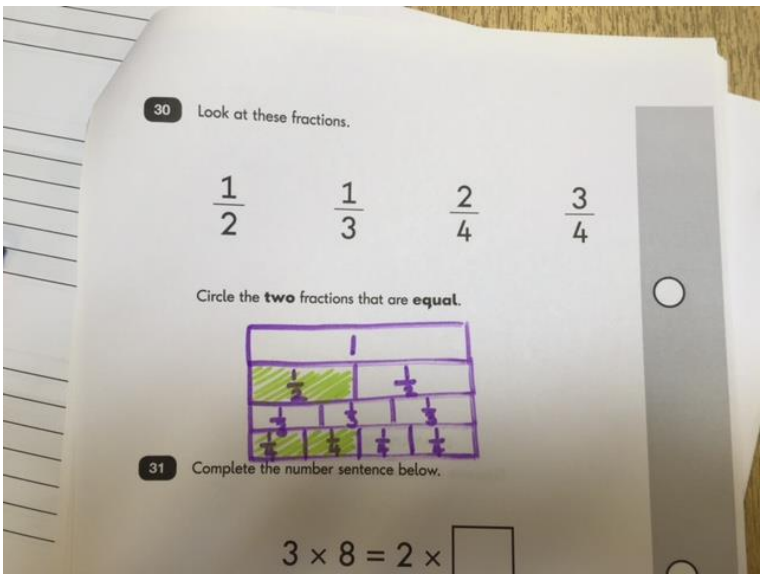
KS2 SATS Sample Papers

The bar models in these examples show how they can be used to represent two step problems that involve more than one operation. In some cases, two step problems can be represented on the same model but in others, two bar models may be needed.

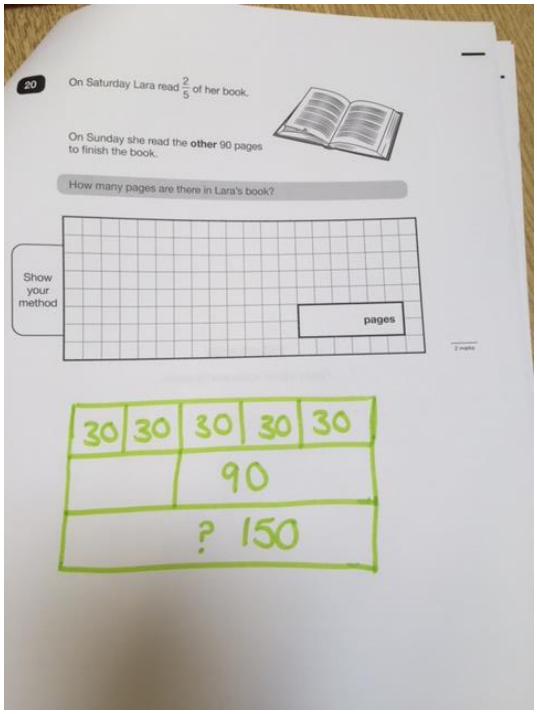




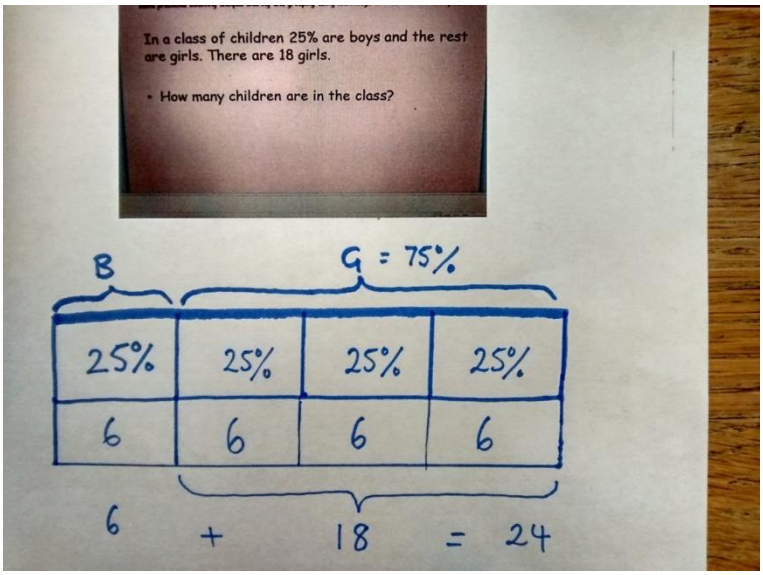
The bar model is also useful to support children with understanding fractions. There is a close link between the models and the fraction wall which is commonly used through school.



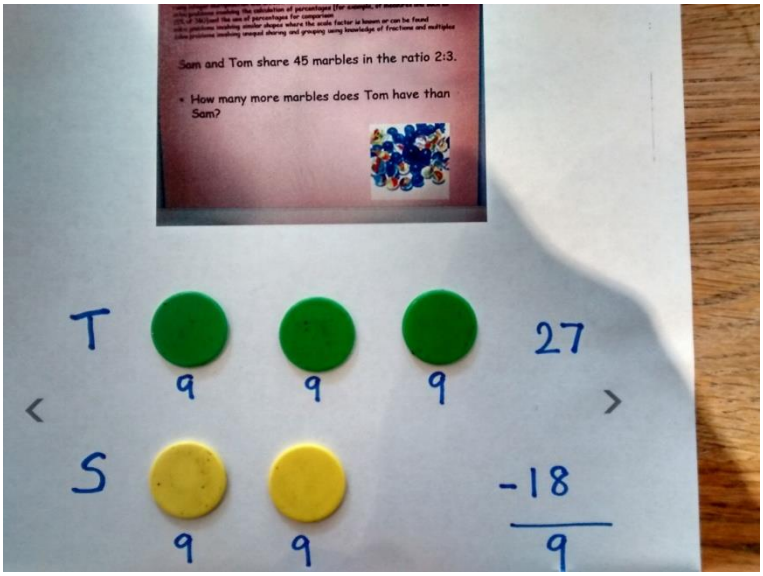
This can then be applied to support children with word problems which involve fractions.



The bar model can be used to represent the part/whole relationships in percentages too. This model helps children to see the three parts which represent the girls to find the total.



A comparison bar model can be used to solve simple ratio problems. Double sided counters are easily manipulated to support children's understanding of ratio.



This can then be applied to support them when solving more complex multi-step problems.