

Bar Models

A visual approach
to word problems

What are bar models?

- ▶ Bar models are pictorial representations of problems or concepts that can be used for any of the operations: addition, subtraction, multiplication and division. In word problems, bar models hold the huge benefit of helping children decide which operations to use or visualise problems.
- ▶ Bar models will not, however, do the calculations for the pupil.

Why are we using them?

We have seen children who have long struggled with maths suddenly experience absolute clarity on matters that previously confounded them. It's given those children a greater level of independence and is helping them to achieve the same things as children considered as "more able".

In short, bar modelling is removing barriers and opening up new possibilities to those who once found maths difficult.

Where do we begin?

CPA

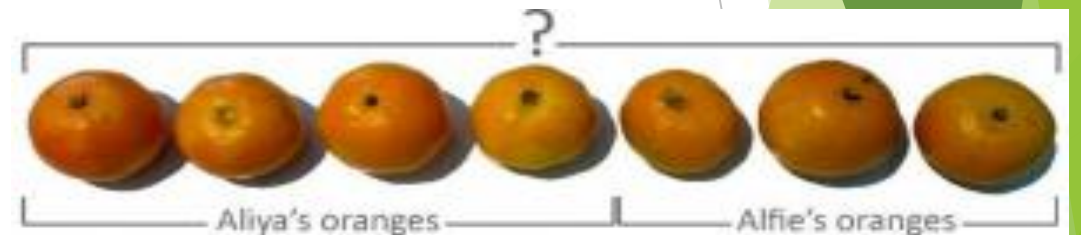
Concrete- real objects

Pictorial-representations

Abstract- representations

Addition -

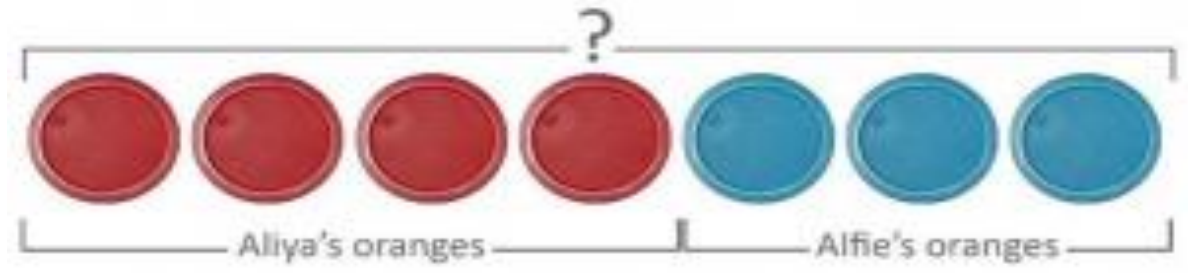
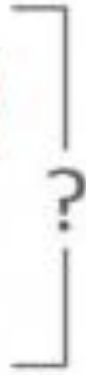
Aliya has 4 oranges and Alfie has 3 Oranges.
How many do they have altogether?

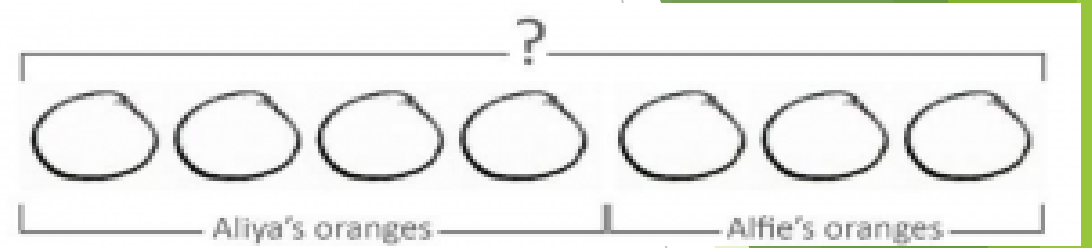
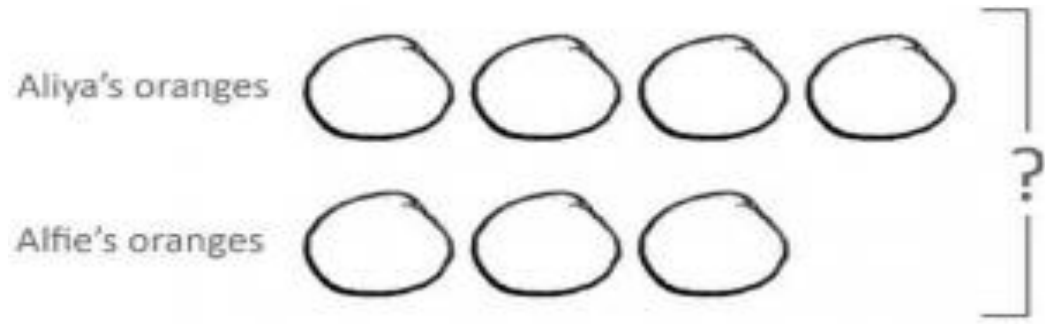


Aliya's oranges

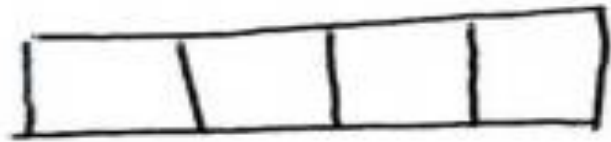


Alfie's oranges

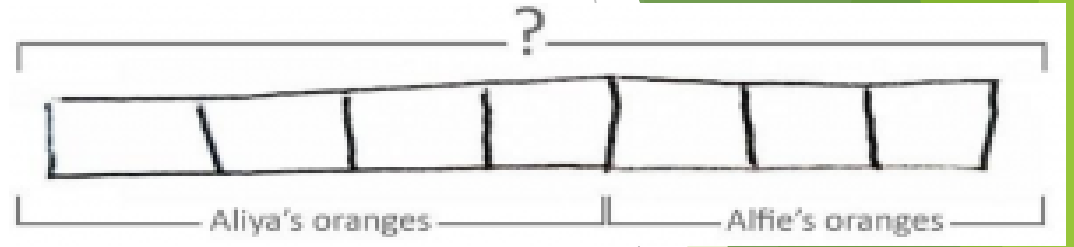
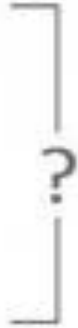
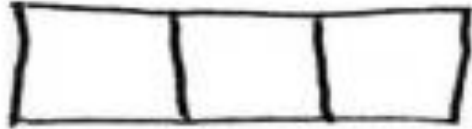




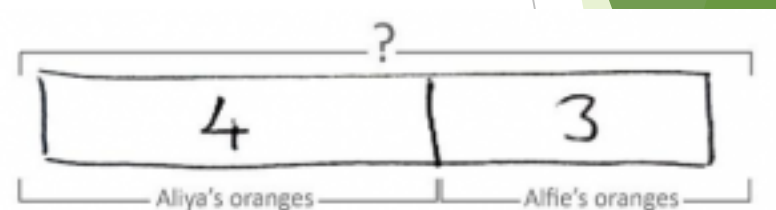
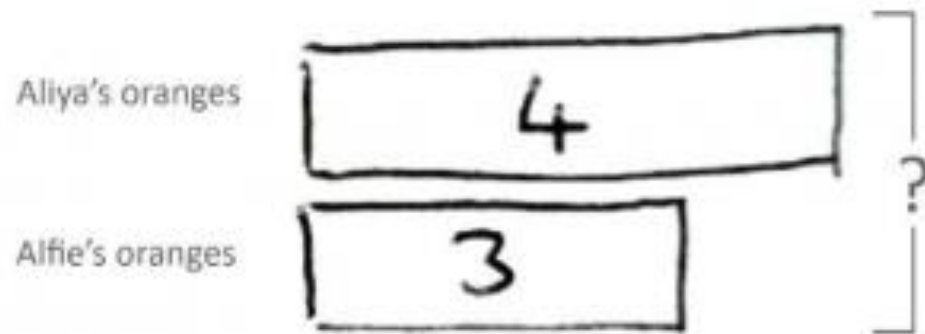
Aliya's oranges



Alfie's oranges



The final stage stops the 1:1 representation.
(End of KS1 expectation - to use to support SATs)



$$4 + 3 =$$

So lets have a go!

If there are 42 children on a bus and 17 more children get on.



How many children are there on the bus in total?

?	
42	17

$$42+17=$$

Subtracting

Important to use concrete – pictorial – abstract scaffolding as used with addition

Part-whole model

Austin has 18 lego bricks. He used 15 pieces to build a small car. How many pieces does he have left?

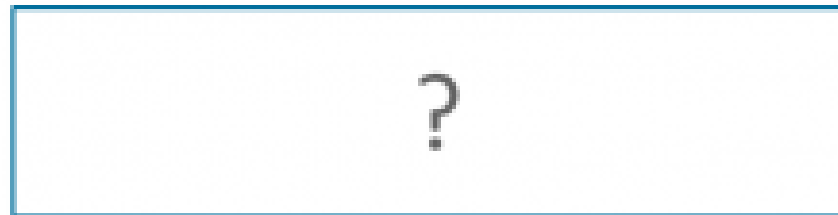
$$18 - 15 =$$

18	
15	?

Find the difference model

Austin has 18 lego bricks. Lionel has 3 lego bricks.
How many more lego bricks does Austin have than
Lionel?

$18 - 3 =$



Bar models of multiplication start with the same 'real' and 'representative counters' stages as addition and subtraction. Then moves to its final stage, drawing rectangular bars to represent each group.

Each box contains 5 cookies. Lionel buys 4 boxes. How many cookies does Lionel have?

?			
5	5	5	5

Division

Sharing

Grace has 27 lollies. She wants to share them into 9 party bags for her friends. How many lollies will go into each party bag?

Grouping

Grace has 27 lollies for her party friends. She wants each friend to have 3 lollies. How many friends can she invite to her party?

The key question at any stage, at any age is **what do we know?**

By training pupils to ask this when presented with word problems themselves, they quickly become independent at drawing bar models.

A bag of 5 lemons costs £1

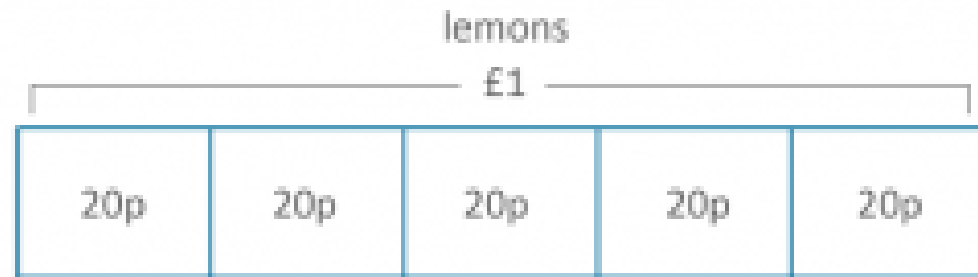
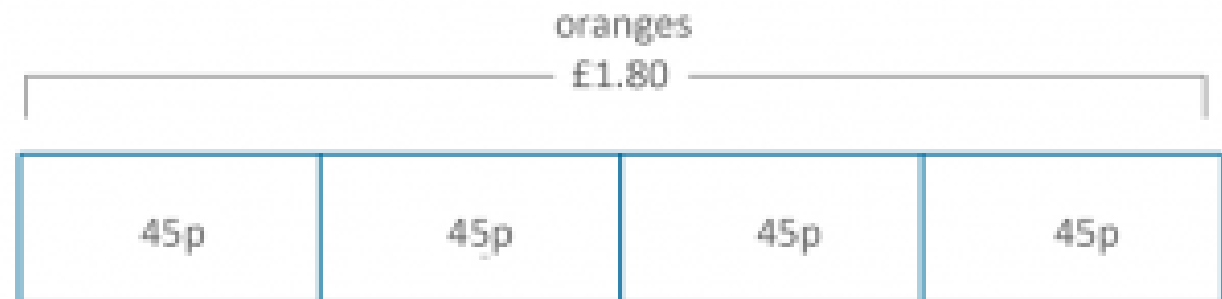
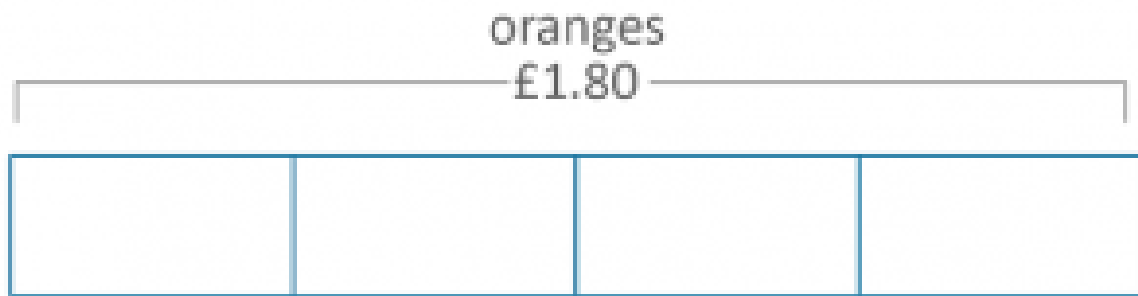
A bag of 4 oranges costs £1.80



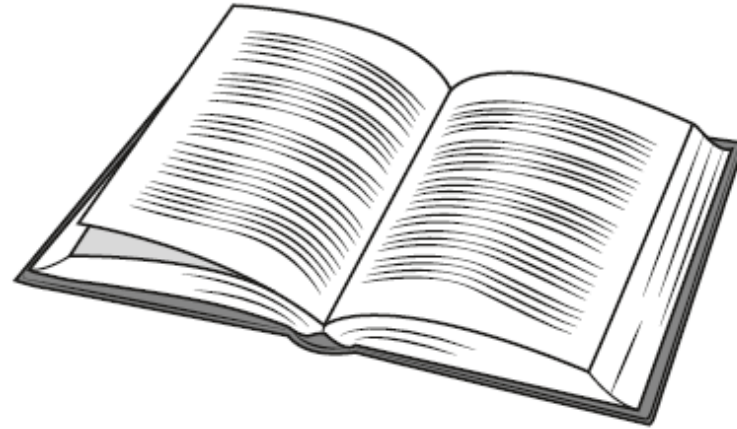
How much **more** does one orange cost than one lemon?

A bag of 5 lemons costs £1. A bag of 4 oranges costs £1.80.
How much more does one orange cost than one lemon?

Pupils could represent this problem in the below bar model, simply by asking and answering 'what do we know?'



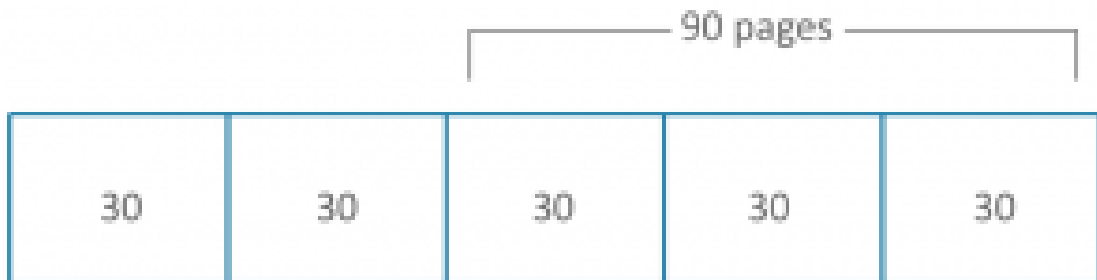
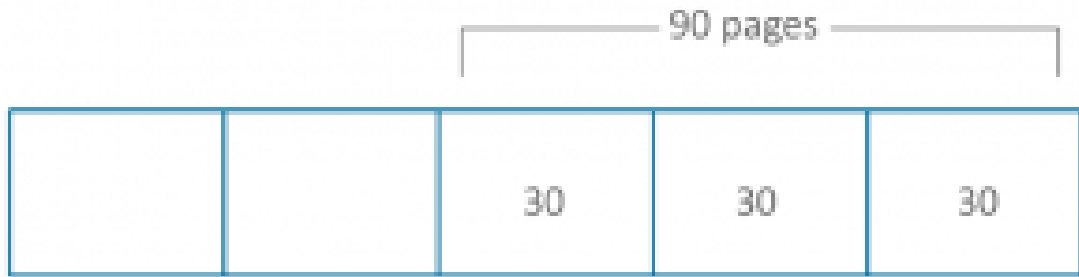
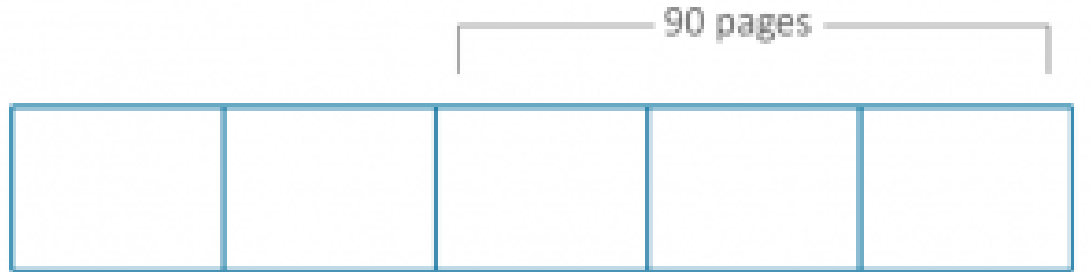
On Saturday Lara read $\frac{2}{5}$ of her book.



On Sunday she read the **other** 90 pages to finish the book.

How many pages are there in Lara's book?

On Saturday Lara read two fifths of her book.
On Sunday, she read the other 90 pages to finish the book.
How many pages are there in Lara's book?
If we create our bar model for what we know:



You can even use it to solve equations!

$$2a + 7 = a + 11$$

What is the value of a?

a	a	7
a	11	

A good introduction to identifying and representing information to solve problems

https://www.mathplayground.com/ThinkingBlocks/modeling_tool.html

<https://www.barmodel.co.uk/>

<http://www.thinkingblocks.com/index.html>

<https://www.mathplayground.com/thinkingblocks.html>