

Bar Modelling

Bar models are pictorial representations of problems or concepts that can be used for a large number of mathematical aspects e.g. any of the operations, fractions, algebra and ratio. In word problems, they hold the huge benefit of helping children decide which operations to use or visualise problems. It is then up to the children to calculate the answer.

5 Step Guide to Bar Models

1) Concrete resources (real objects) *1:1 representation*



2) Substituted concrete resources (counters, cubes, buttons) *1:1 representation*



3) Pictorial representations (circles) *1:1 representation*



4) Objects as part of a bar (individual squares) *1:1 representation*



5) Rectangular bars (approximates)



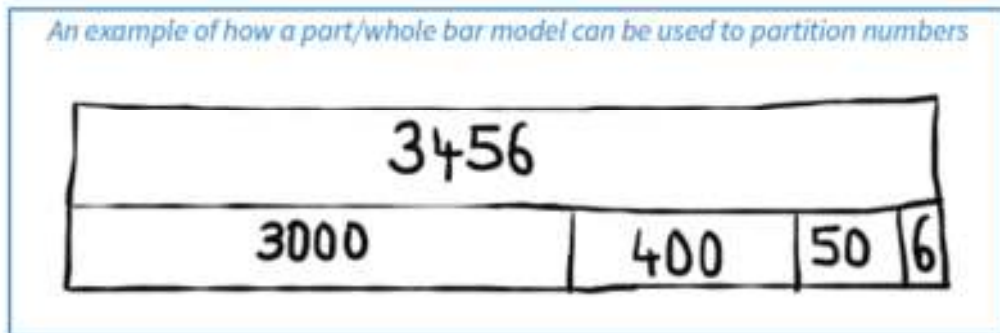
EYFS

Part part whole. Use concrete objects in hoops or plates. Adults



Place Value

When partitioning numbers to understand place value a bar model can be used to show the different parts.



Bar models don't have to be totally accurate in their representations of the relative sizes of numbers, but it is important they at least show that larger numbers are in some way proportionally different in size to smaller numbers. Given that place value is usually covered at the beginning of the year, using bar models at that point is a good way to get children practising their representations of different number sizes.

Addition and Subtraction

Addition

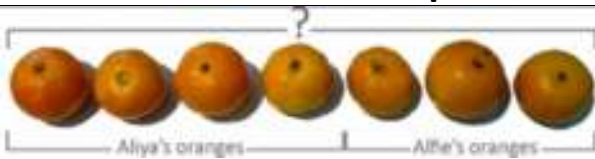
KS1

Follow the 5 step guide.

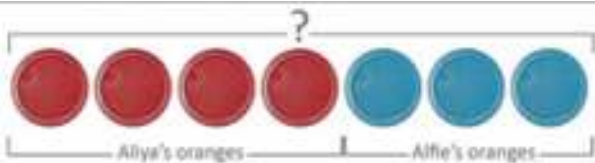
Types of addition problem: aggregation (two quantities combined) or augmentation (a quantity is increased).

Example question: Aliya has 4 oranges. Alfie has 3 oranges. How many oranges are there altogether?

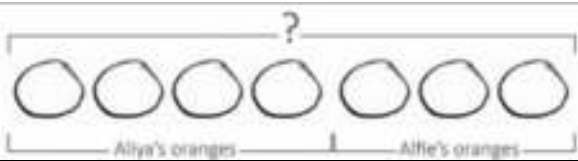
Step 1: Use concrete objects



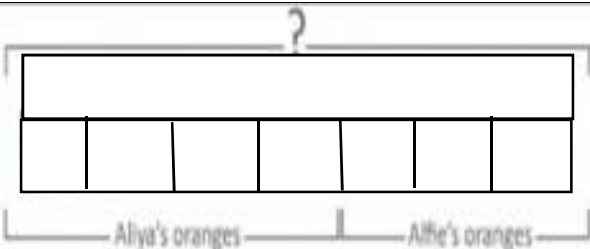
Step 2: Replace the real concrete objects with concrete representations of the object (e.g. counters or cubes)



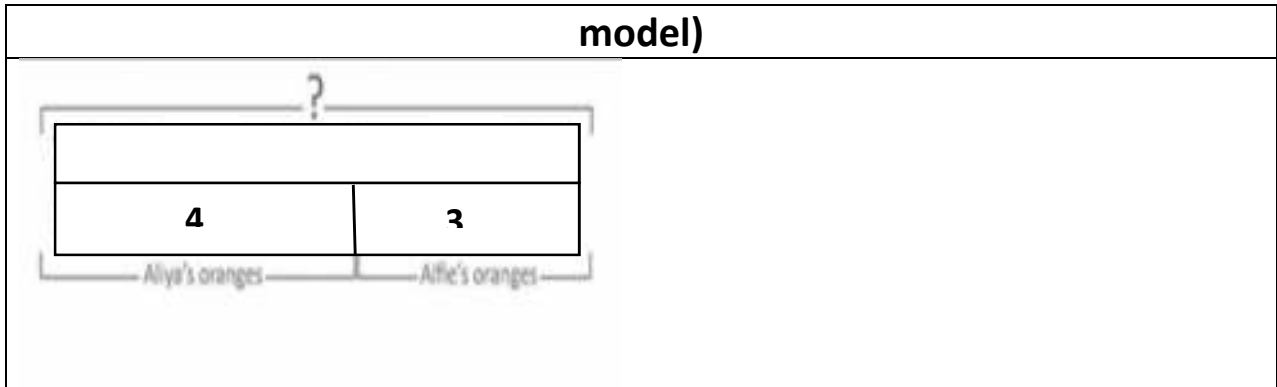
Step 3: Children represent the objects pictorially themselves



Step 4: Represent each object as part of a bar (discrete model)



Step 5: Each quantity is represented as a rectangular bar (continuous



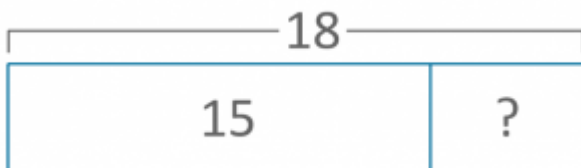
Subtraction

The same 5 step guide should be applied to subtraction as for addition.

There are two different types of bar model: One represents a 'part-part-whole' model, the other a 'find the difference' model. Each will be more suited to different word problems.

Part-part-whole

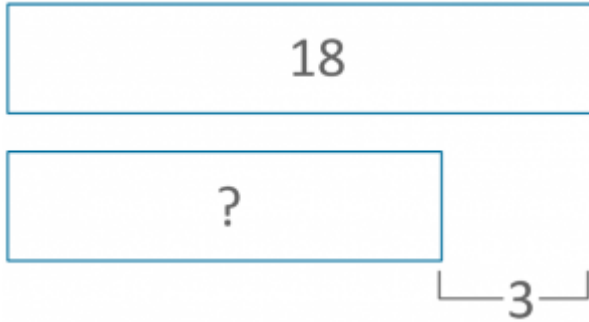
Austin has 18 Lego bricks. He used 15 pieces to build a small car. How many pieces does he have left?



Calculation: $18 - 15 =$

Find the difference

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



Calculation: $18 - 3 =$

Addition and Subtraction

Equivalen

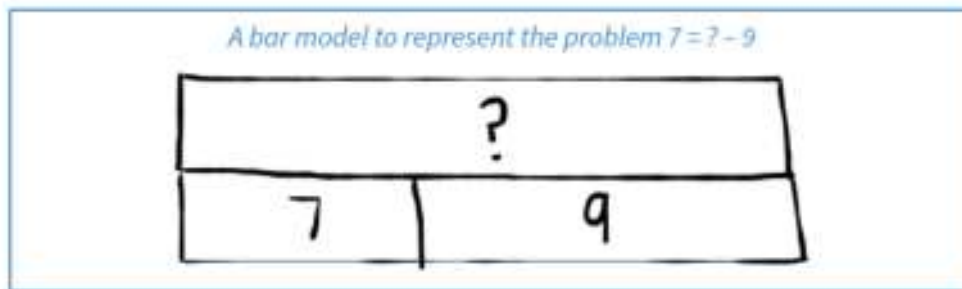
The model can be rearranged to demonstrate equivalence in a traditional layout



Pupils need to develop fluency in using this structure to represent addition and subtraction problems in a variety of contexts using the bar model. The model will help children to see that different problems share the same mathematical structure and can be visualised in the same way. Asking children to write their own problems, using the bar as the structure will help to consolidate this understanding.

Missing Number Problems

Missing number problems feature in the curriculum from Year 1 to Year 6. Bar models are a great way to help children of all ages to find missing numbers, whether that's $7 = ? - 9$ in Year 1 or expressing missing number problems algebraically in Year 6.



KS2

The bar models constructed for addition and subtraction remain the same but questions will include larger numbers, measures, money, decimal numbers etc. Children may need to use a series of bar models to answer multi-step problems.

Example addition and subtraction worded problems:

Y1	Y2
1. Ebony has 5p and Daniel has 8p. How much do they have altogether?	1. Dylan has 37 coloured pencils and he buys 30 more. How many does he have now?
2. A lolly costs 6p. Amrit paid with a 10p coin. How much change does he get?	2. Janie has 40 beads. She loses 25 of them. How many does she have left?
3. Michael says that $16 + 5 = 21$. Is he correct?	3. What is the difference between seventy six and thirty five?
4. I think of a number. I subtract 5. The answer is 4. What was my number?	4. I think of a number. I subtract 5. The answer is 4. What was my number?

	5. A tub contains 24 coins. Saj takes 5 coins. Joss takes 10 coins. How many coins are left in the tub?
<p style="text-align: center;">Y3</p> <p>1. There are 334 children at a School and 75 at a Nursery. How many children are there altogether?</p> <p>2. Gemma collected 293 badges but she gave 45 of them to her friend, Rebecca. How many badges did she have left?</p> <p>3. If you spend 61p at the corner shop, how much change do you get from £1.00?</p>	<p style="text-align: center;">Y4</p> <p>1. Martin has saved £6.78 and spends £4.69. How much does he have left?</p>

(Y5 and Y6 – multistep problems involving the 4 operations – see questions after multiplication and division)