# Solving Number Problems the Singapore Way:

Using the bar model

Almond Hill Junior School

Specialists in Mathematical Reasoning and Thinking

# We will consider…

- The progression in solving problems using the bar model
- How to use the bar model to solve problems

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# The NC 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 have **conceptual understanding** and are able to recall and apply their knowledge rapidly and accurately to problems
- **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.

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# Mathematical understanding involves using representations…

C Concrete

P Pictorial

A Abstract

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# Definition of a maths problem

The person confronting it wants or needs to find a solution.

The person has no readily available procedure for finding the solution.

The person must make an attempt to find a solution.

**Learning how to solve problems in mathematics, is knowing what to look for.**

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# Solving a problem involves…

- Identifying and understanding what the problem is
- Planning how to solve it
- Monitoring progress in tackling the problem
- Reviewing and evaluating any solutions

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Peter has 4 books.

Harry has five times as many books as Peter. How many more books has Harry?

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# Issues in problem solving…

RUCSAC

1. Read
2. Underline
3. Calculate
4. Solve
5. Answer
6. Check

Peter has **4** books.

Harry has **5 times** as many books as Peter.

**How many** more books has Harry?

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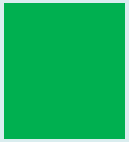
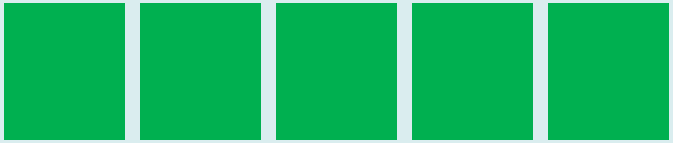
Peter's books



Harry's books



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# What is the bar model?

- A mathematical representation of a word problem
- A representation that **reveals the structure** of a word problem
- **Not** a calculating tool

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# Number problems always:

- contain **part** and **whole** relationships.
- contain **knowns** and **unknowns**

Peter has 4 books.
Harry has five times as many books as Peter. How many more books has Harry?

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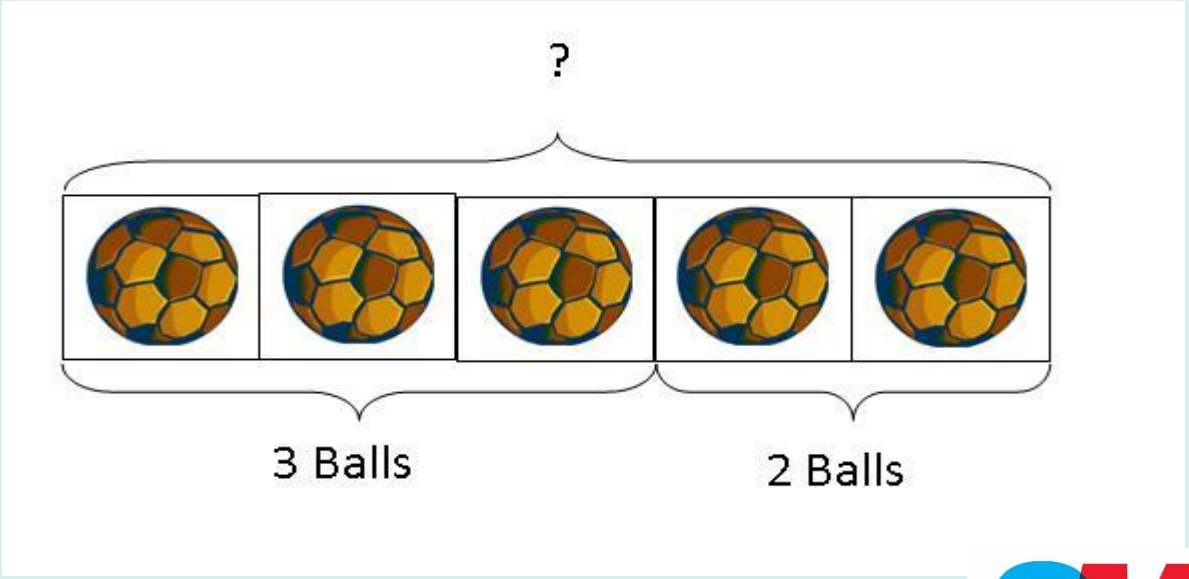
To become proficient at using this model, children need to be introduced to it early in their education...

There are 3 footballs in the red basket and 2 footballs in the blue basket.
How many footballs are there altogether?

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There are 5 apples and 6 oranges. How many pieces of fruit altogether?

parts

?

5

6

**Concrete**

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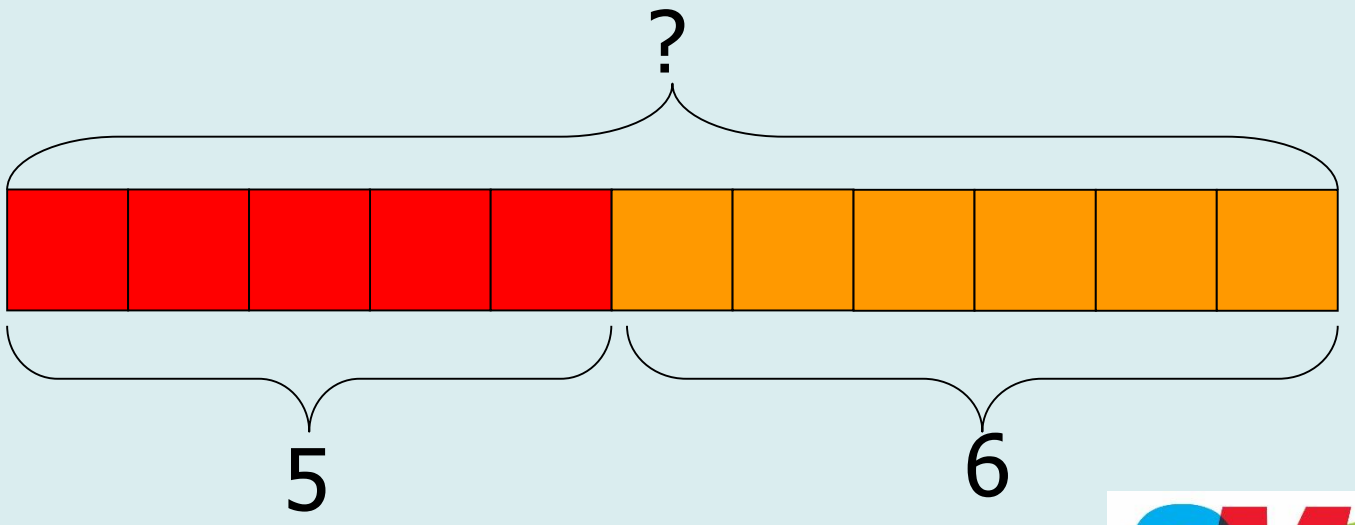
There are 5 apples and 6 oranges. How many pieces of fruit altogether?




**Pictorial**

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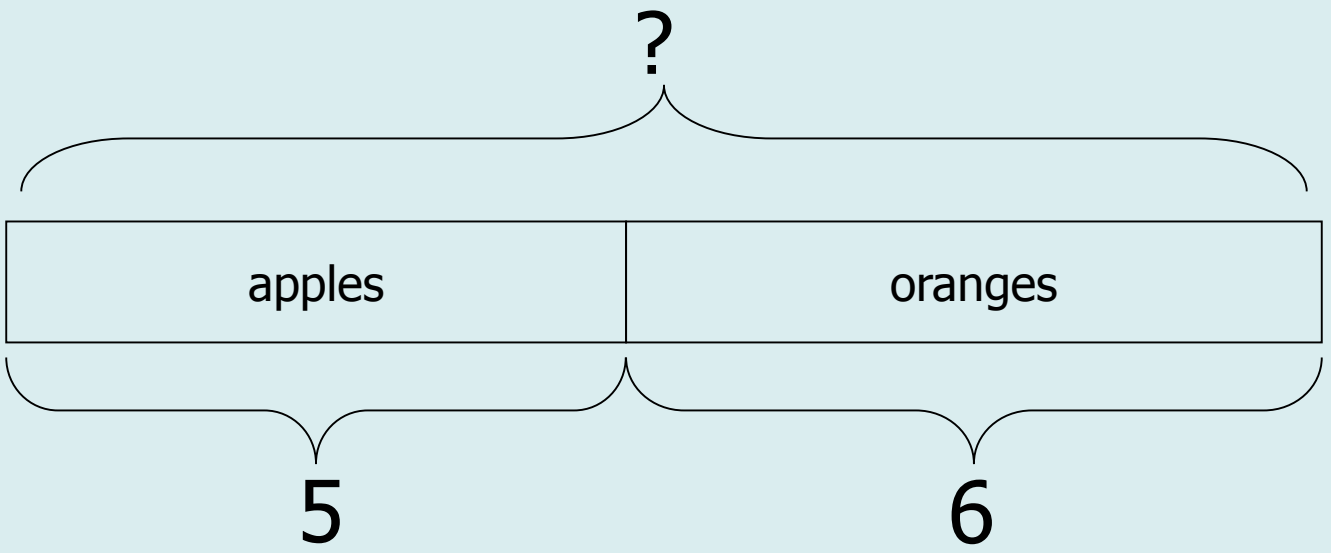


## Abstract

**5 + 6 = 11**

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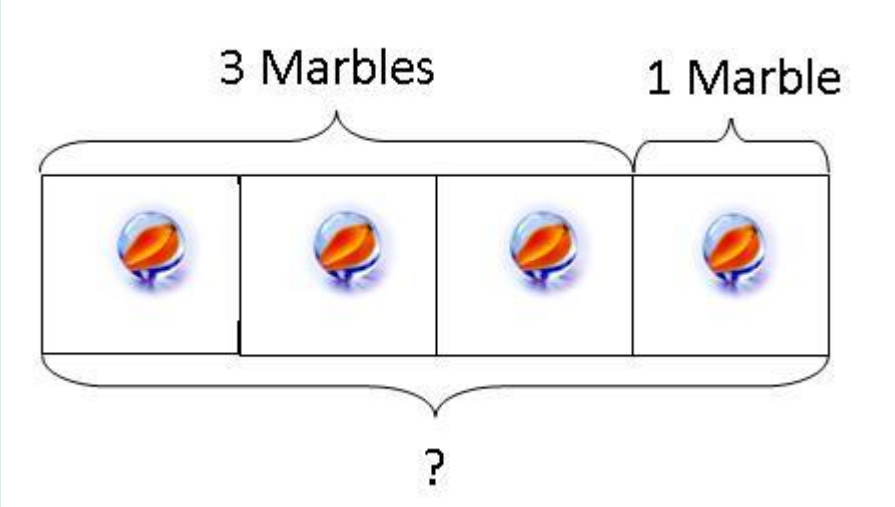
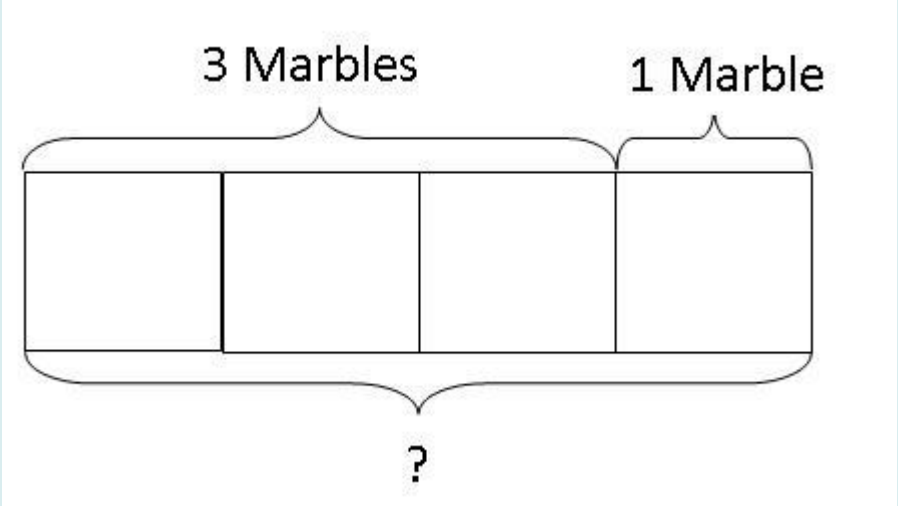
Peter has 3 marbles.

Harry gives Peter 1 more marble.

How many marbles does Peter have now?




Concrete → Abstract

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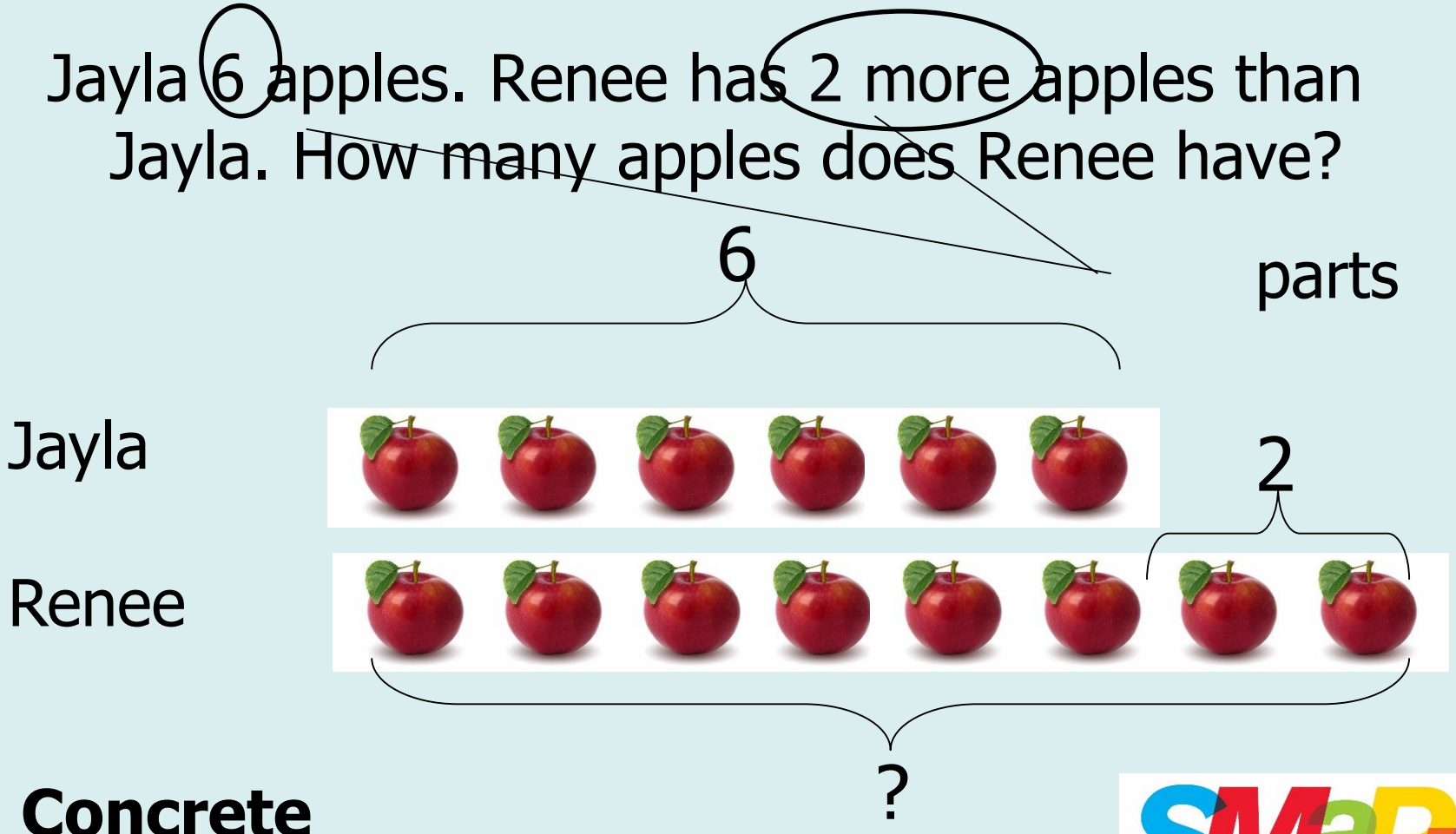
Jayla 6 apples. Renee has 2 more apples than Jayla. How many apples does Renee have?




**Concrete**

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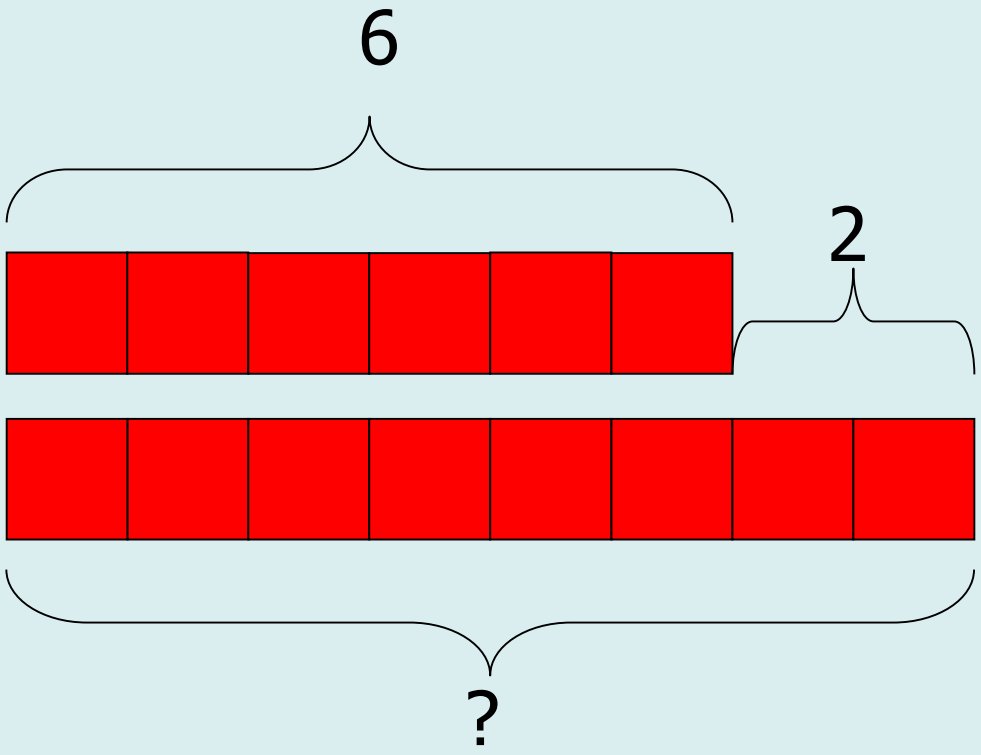


**Pictorial**

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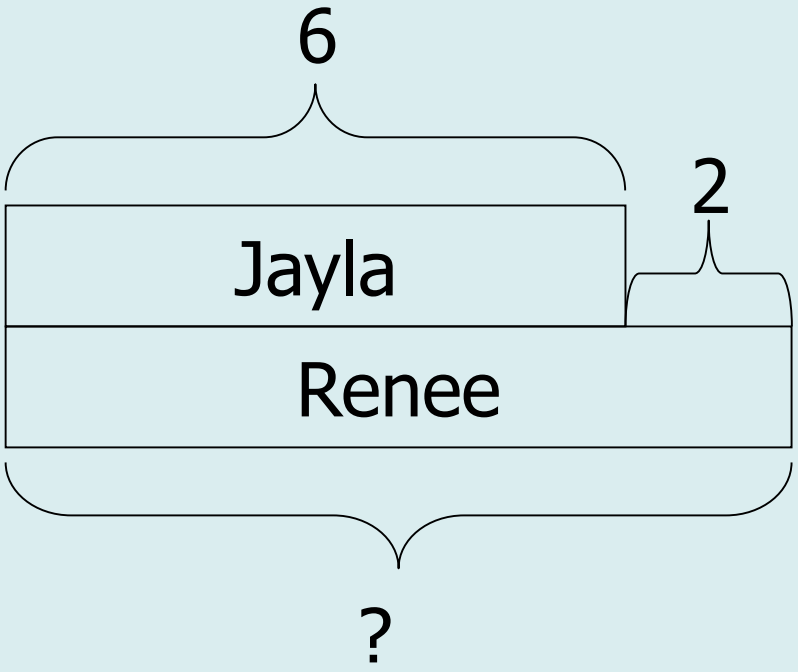


**Abstract**

**6 + 2 = 8**

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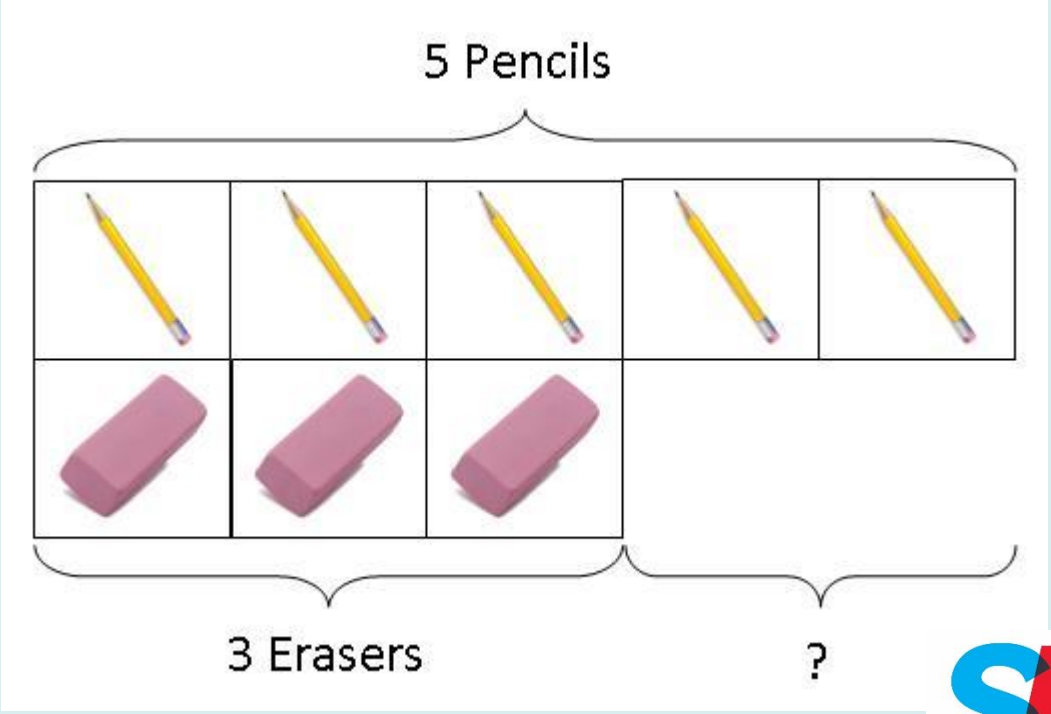
Peter has 5 pencils and 3 erasers.

How many more pencils than erasers does he have?

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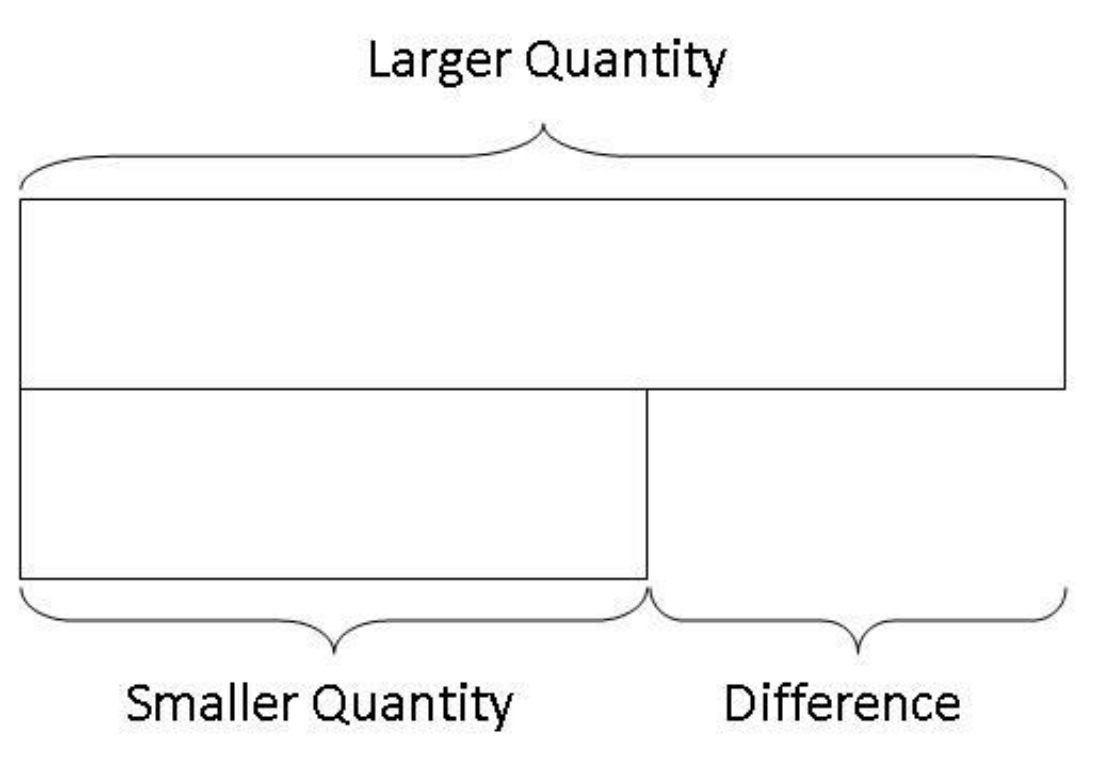
# Generalisation

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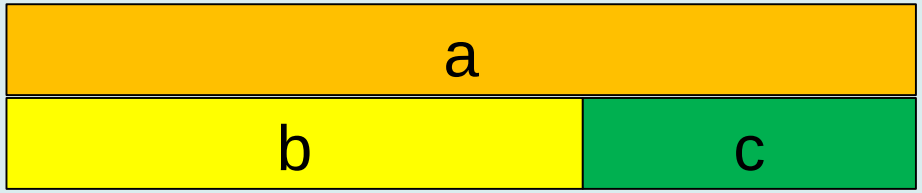


a – b = c
a – c = b
b + c = a
c + b = a

This generalisation can then help the children solve, for example, missing number problems using the bar model approach:

45 + ? = 93, ? – 62 = 13, 146 - ? = 79, ? + 82 = 147

Ella has some cherries. She eats 2. Then she eats half of what is left. She now has 6. How many did she have to begin with?

- Identify the 'knowns' and 'unknowns'.
- Label the 'known' parts and/or wholes
- Label the 'unknown' parts and/or wholes
- Write the number sentence/equation

KS1

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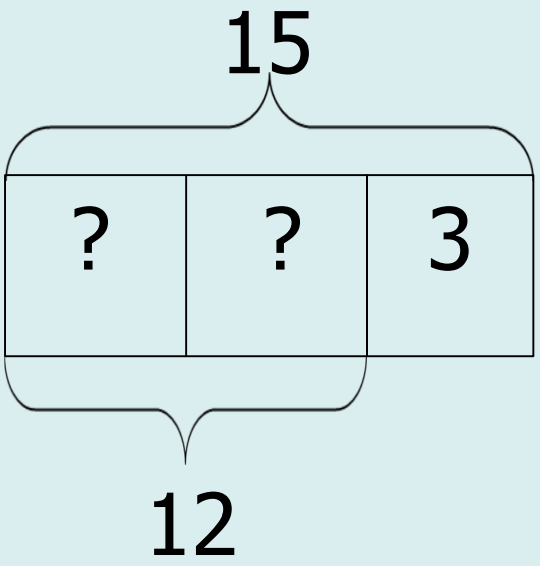
Kemi is looking at a number on a card.
She doubles the number then adds 3.
Her answer is 15.
What number is she looking at?

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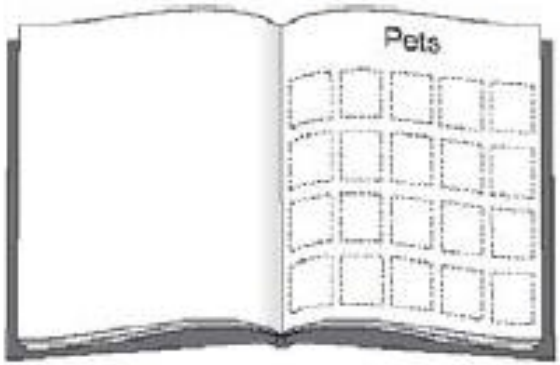
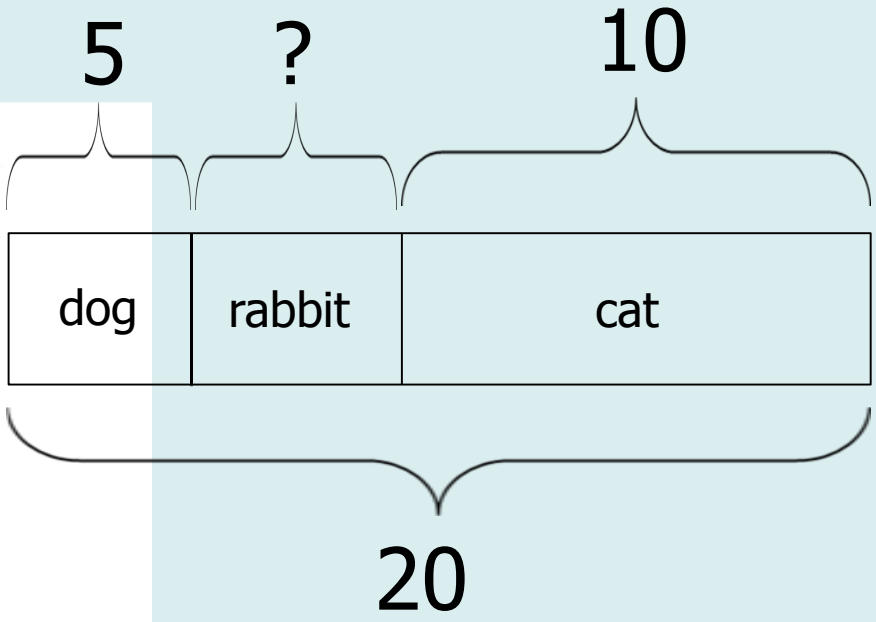
Meg has 20 pet stickers to go on this page.




$\frac{1}{4}$ of them are dog stickers.
$\frac{1}{2}$ of them are cat stickers.
The rest are rabbit stickers.

How many rabbit stickers does she have?

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# KS2 2012

**24** In a class, 18 of the children are girls.

A quarter of the children in the class are boys.

Altogether, how many children are there in the class?


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$^{3}/_{8}$ of the sweets in the tin were chocolates. $^{1}/_{4}$ were toffees. The rest were strawberry creams. There were 36 strawberry creams. How many sweets were in the tin?

Annie answered $^{4}/_{5}$ of the questions on the test. She answered 28. How many questions were on the test?

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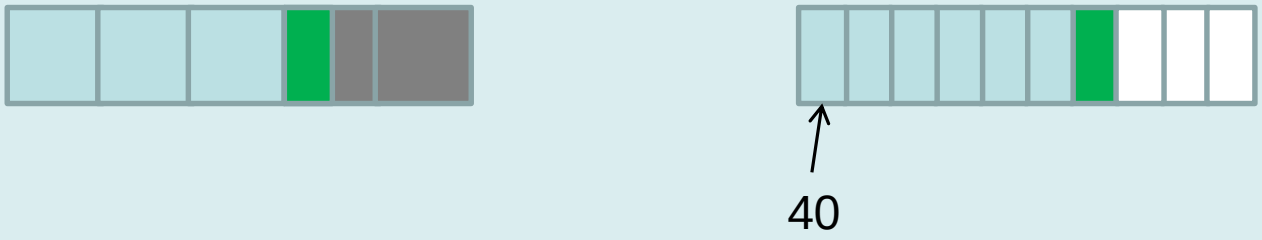
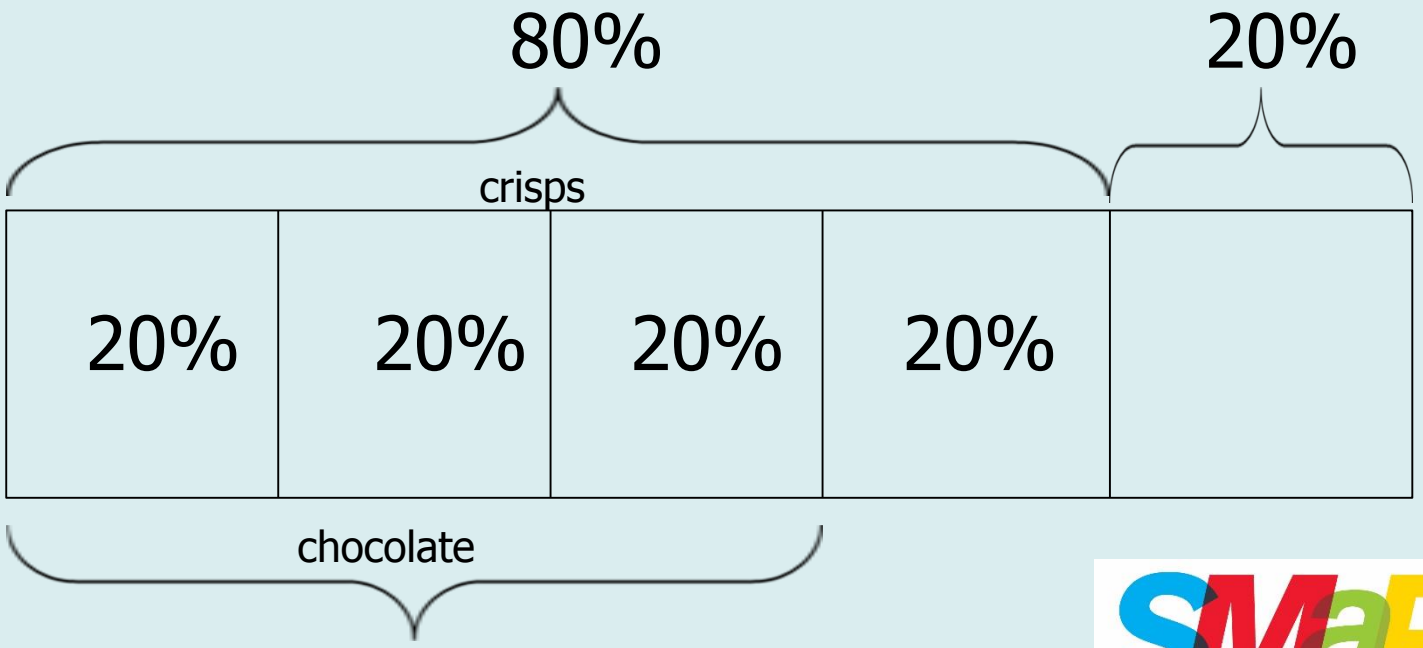
Sophie made some cakes for the school fair. She sold $^{3}/_{5}$ of them in the morning and ¼ of what was left in the afternoon. If she sold 200 more cakes in the morning, how many cakes did she make?'



In Class 6, 80% of the children like crisps.
75% of the children who like crisps also like chocolate.
In Class 6, what percentage of the children like both crisps and chocolate?

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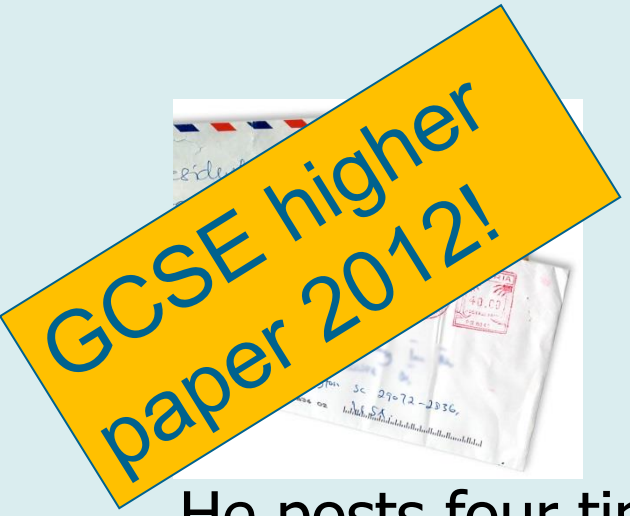


Ralph posts 40 letters, some of which are first class, and some are second.

He posts four times as many second class letters as first.

How many of each class of letter does he post?

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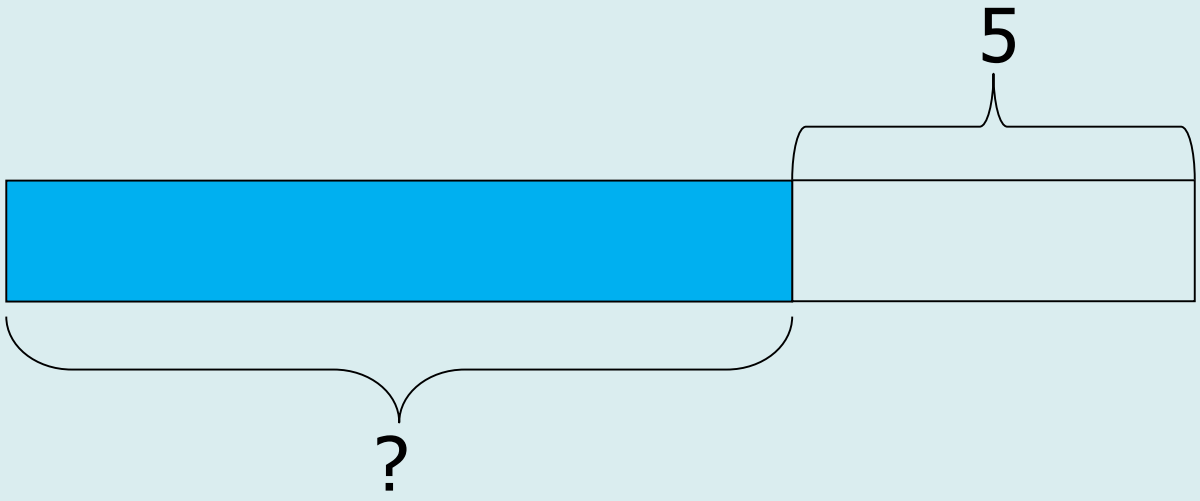
# Write a problem for this:

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NCETM – Bar Modelling

Thinking Blocks

Bar Modelling – Yeap Ban Har

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