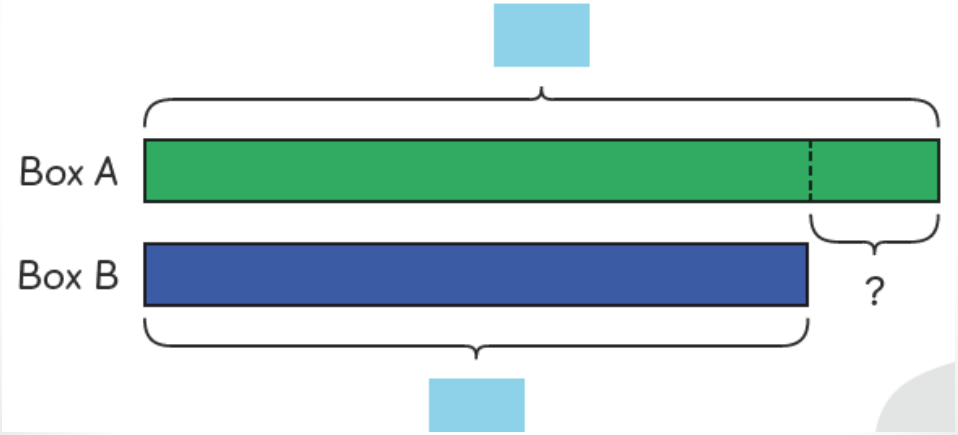
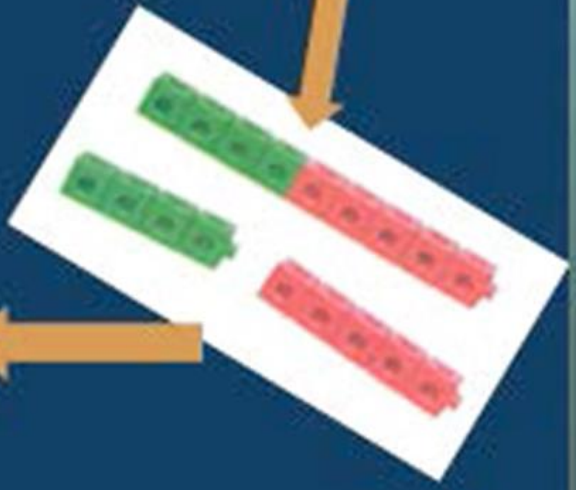
Using Bar Models



Bar Models

- What are ‘bar models’?
- How are bar models used?
- What do bar models look like across key stages?

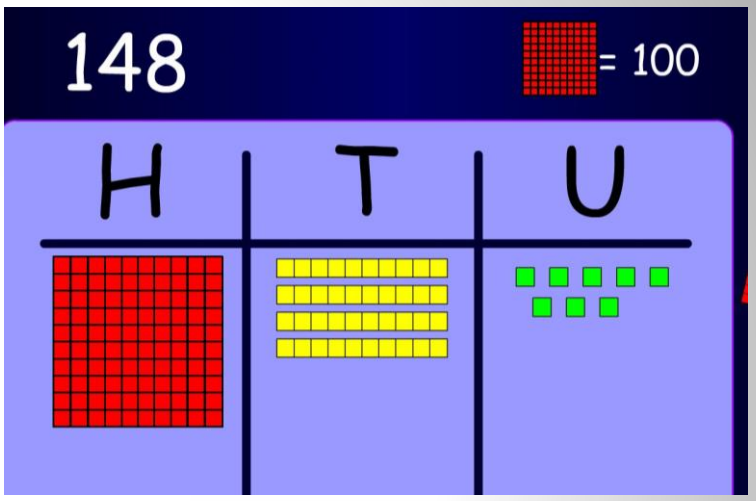
Concrete

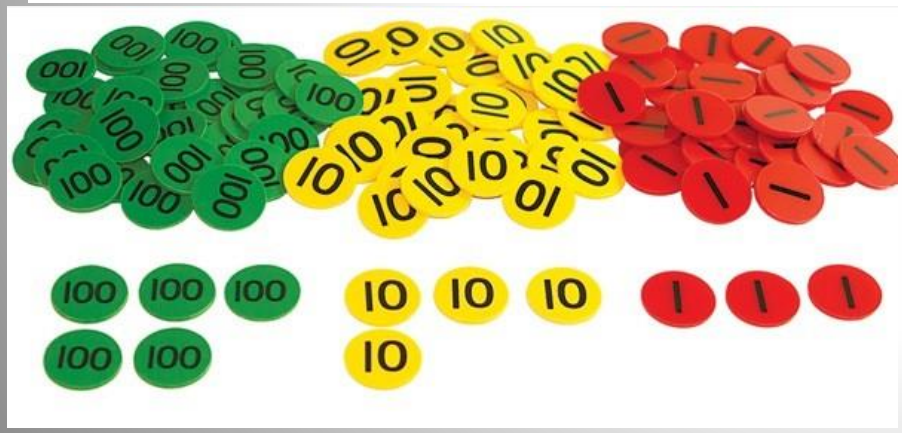


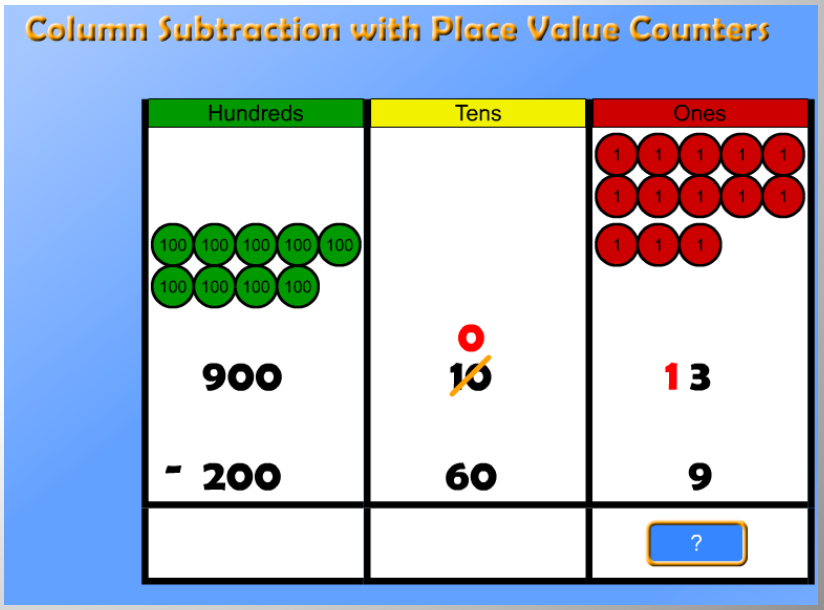
"Students who use concrete materials develop more precise and more comprehensive mental representations, often show more motivation and on-task behavior, understand mathematical ideas, and better apply these ideas to life situations."

Start with the “real thing” …

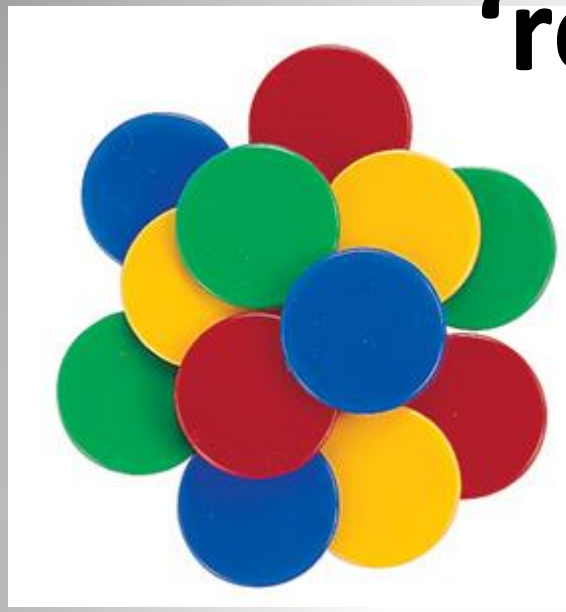
And finally…
place value rods and counters

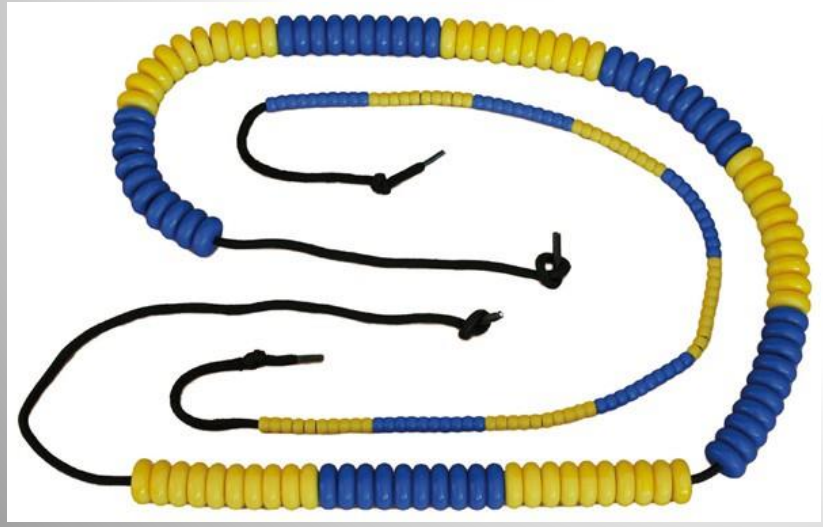






Then representations of the ‘real’ thing…





Take a Strip and a paperclip

Your Strip Represents 10p

- Show me 5p
- Show me 2p
- Show me 8p
- Show me 7p

Your Strip Represents 1 metre

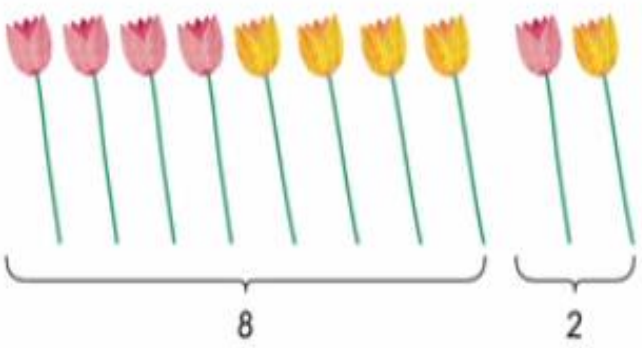
- Show me 50cm
- Show me half a metre
- Show me 20cm
- Show me 80cm
- Show me 70cm

THE FOUNDATIONS FOR BAR MODELS

Concrete - modelling with real objects

Should we add or subtract to find the total number of flowers?

There are 8 flowers in the vase.
There are 2 flowers in Hannah's hand.
How many flowers are there in total?



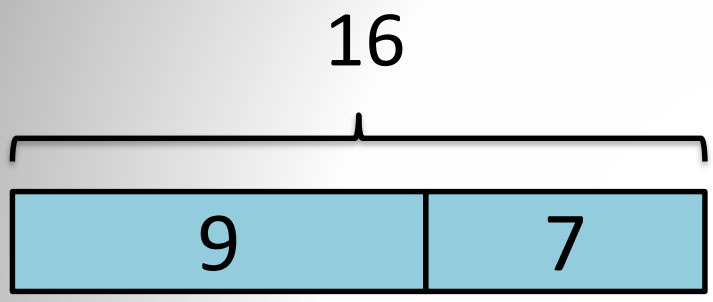
$8 + 2 = 10$

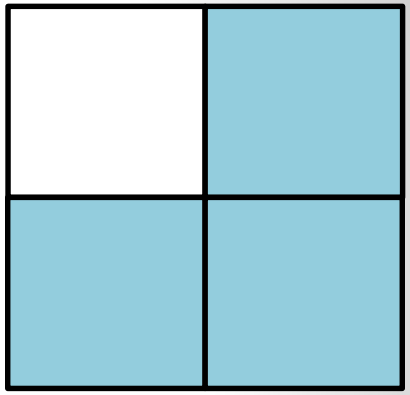
There are 10 flowers in total.

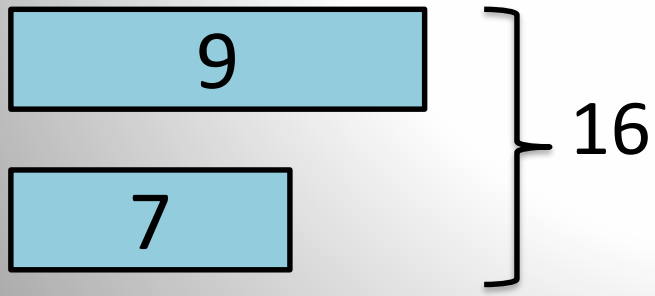
Foundation for bar models

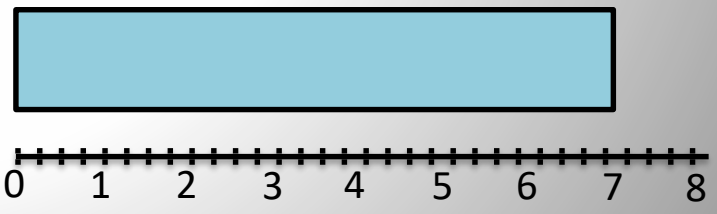
- Concrete – flowers cubes or counters
- Pictorial – drawing cubes or counters
- Abstract- part whole diagram

What Are Bar Models?

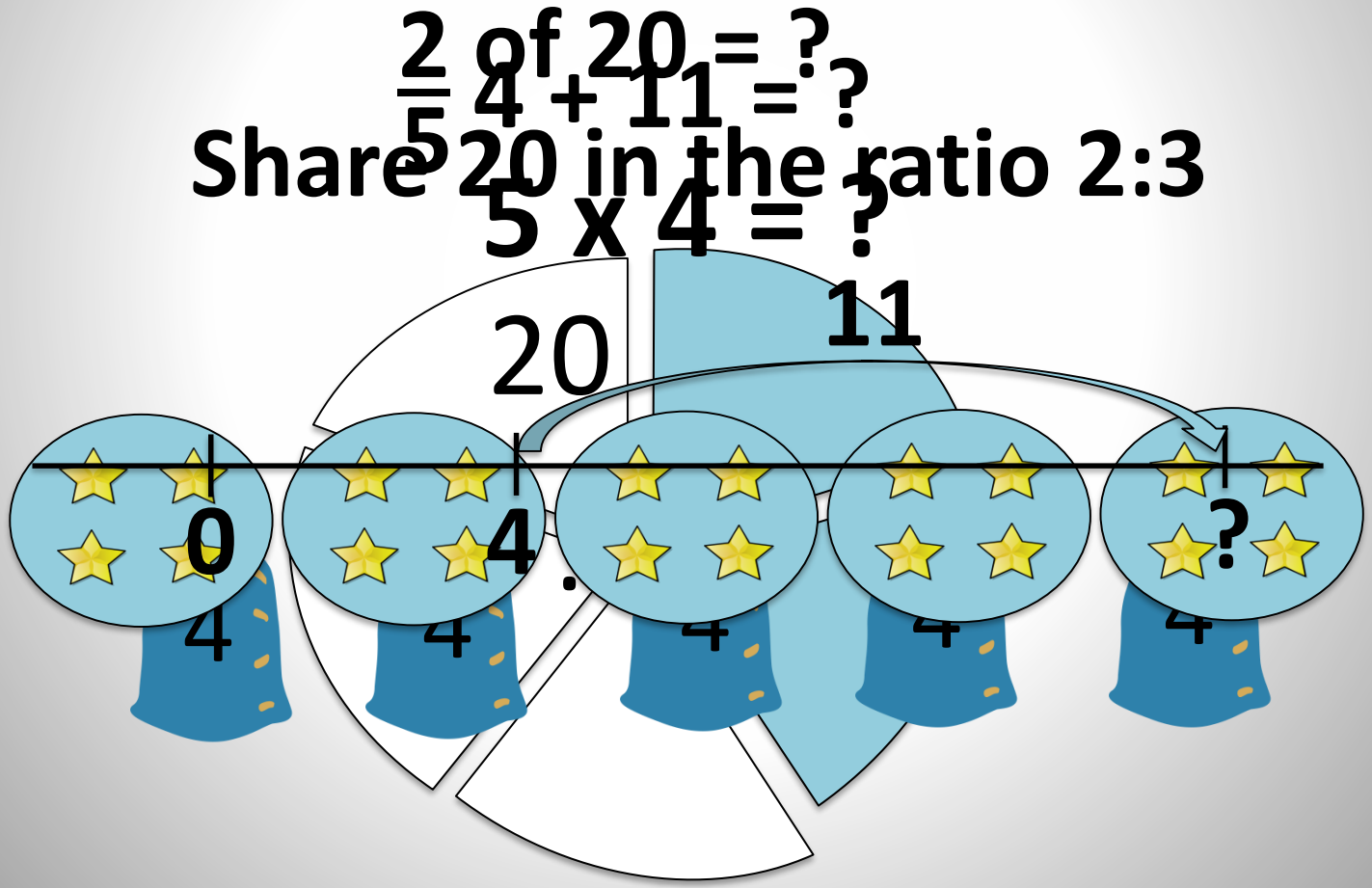






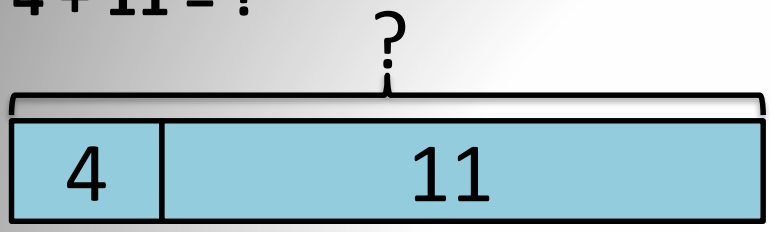


A Consistent Picture

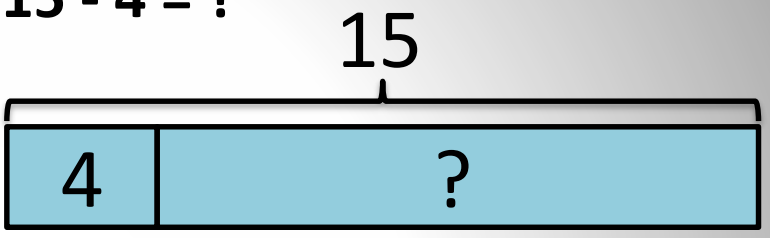


A Consistent Picture

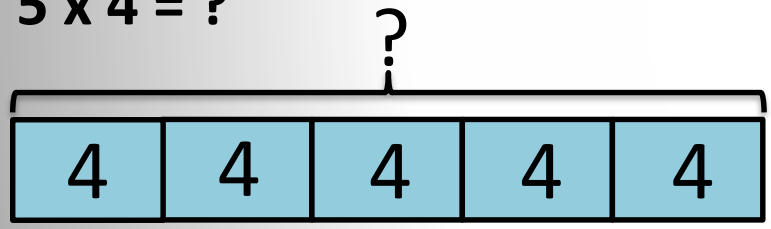
4 + 11 = ?



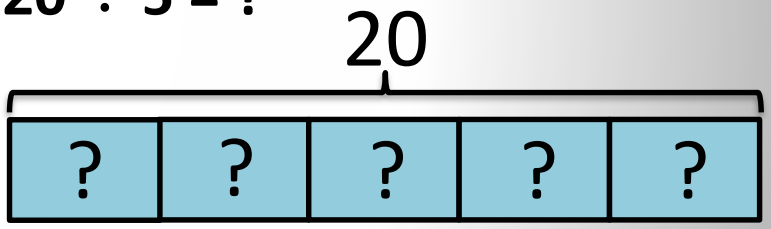
15 - 4 = ?



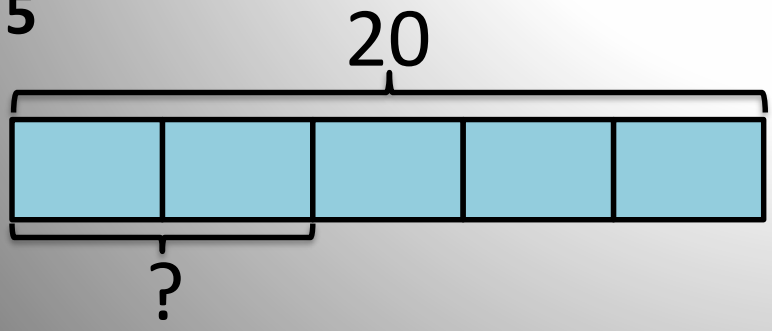
5 x 4 = ?



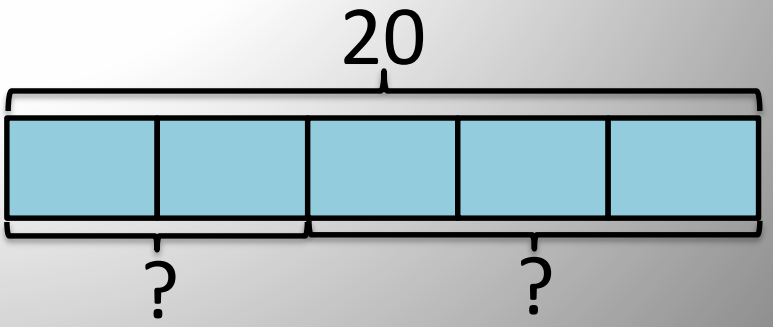
20 ÷ 5 = ?



$\frac{2}{5}$ of 20 = ?



Share 20 in the ratio 2:3



When solving word problems, it is often not the calculation that children can't do – rather they are not sure which calculation they need to do.
(NCETM, 2013)

The Importance of Bar Modelling

"Bar models are a tool to help children visualise stories"

Ban Har 2016

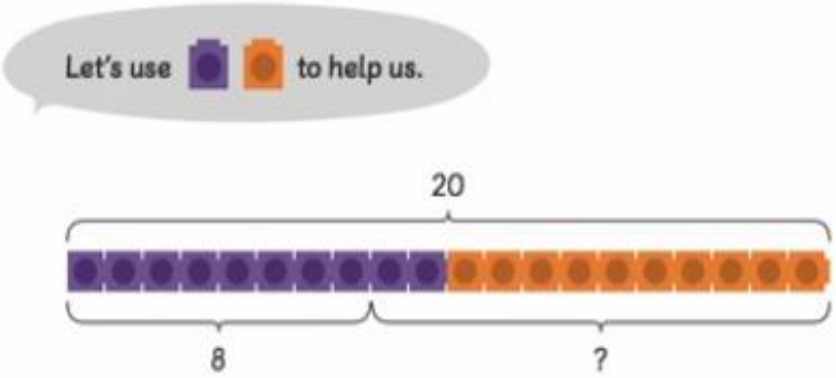
"Although bar models will not always help children carry out required calculations, they are clearly designed to help children decide which operations to use."

Beckmann 2014

THE FOUNDATIONS FOR BAR MODELS

Concrete – modelling with other objects and pictures

Sam bakes 20 cookies.
What if he gives some away?



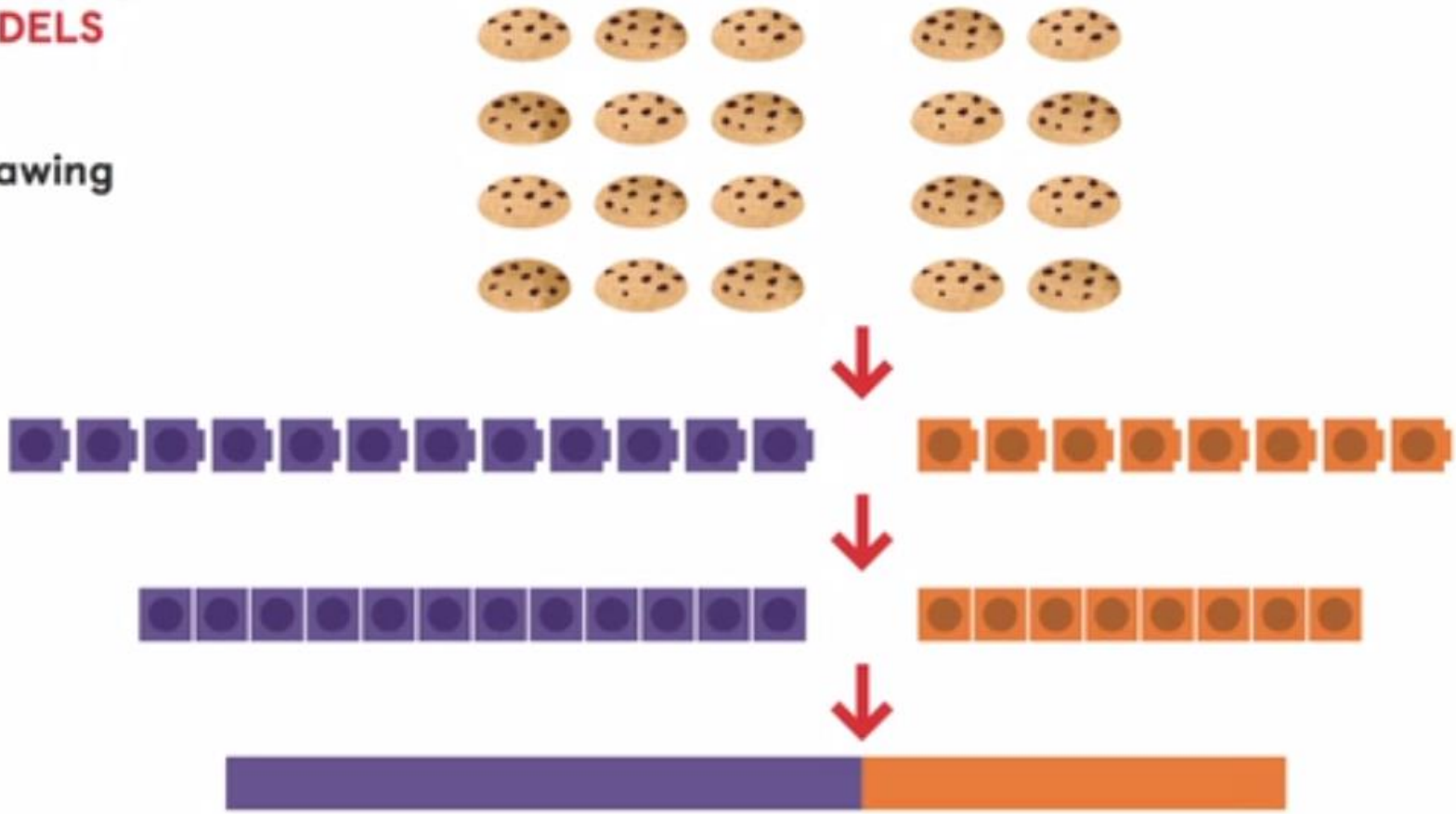
What if Sam gives away 8 cookies?

20 – 8 = ☐

Then, Sam would have ☐ cookies left.

THE FOUNDATIONS FOR BAR MODELS

Concrete to pictorial - drawing



Bar Models

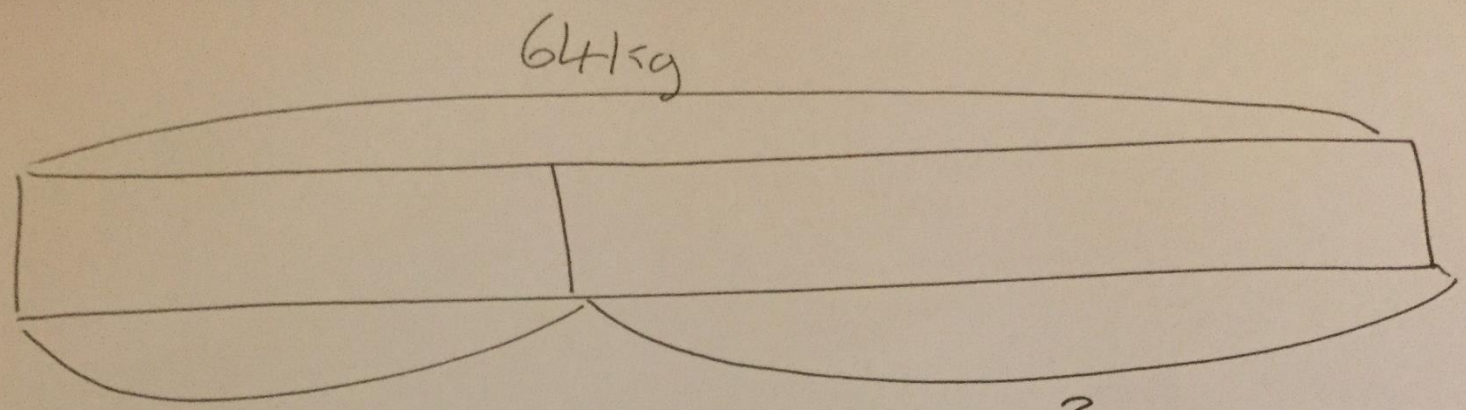
Year 1 – foundations for bar models

Year 2- bar models drawn

Year 3 – Children draw own bar models

Year 2 Textbook 2A C6L6

Together, Sam and Ravi weigh 64 kg.
Sam weighs 31 kg.
What is Ravi's mass?



$64\text{kg} - 31\text{kg} =$

$$\begin{array}{r} 64 \\ -\,31 \\ \hline 33 \end{array}\ \text{kg}$$

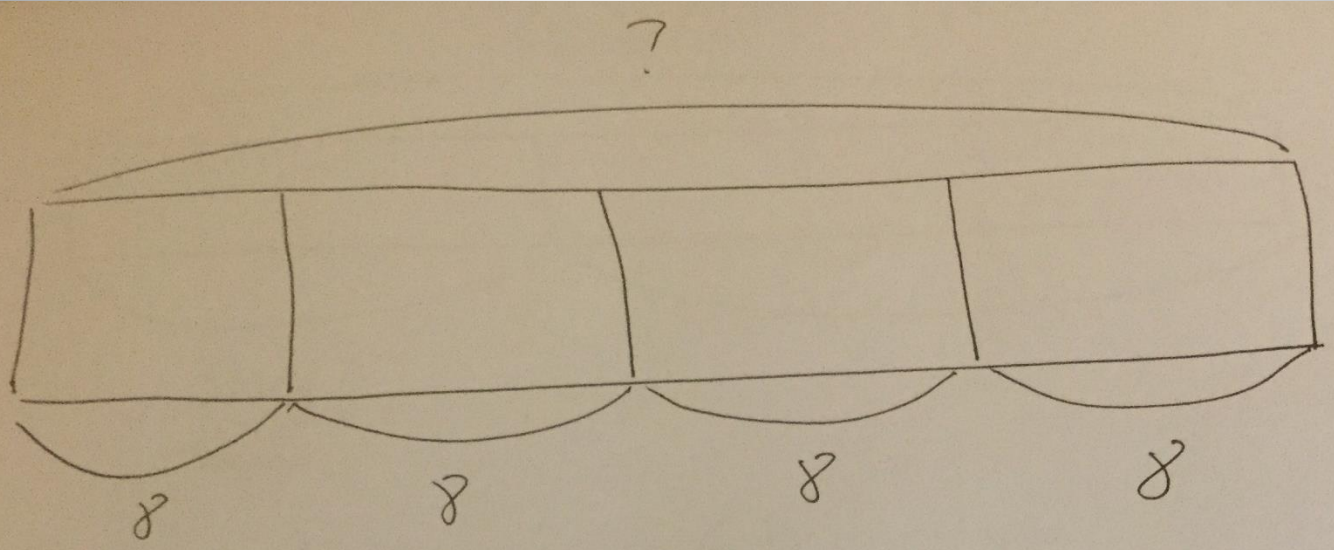
Ravi's mass is 33kg

PART-WHOLE MODEL

Charles has to arrange some chairs in 4 rows.

Each row has 8 chairs.

How many chairs are there altogether?



$4 \times 8 =$

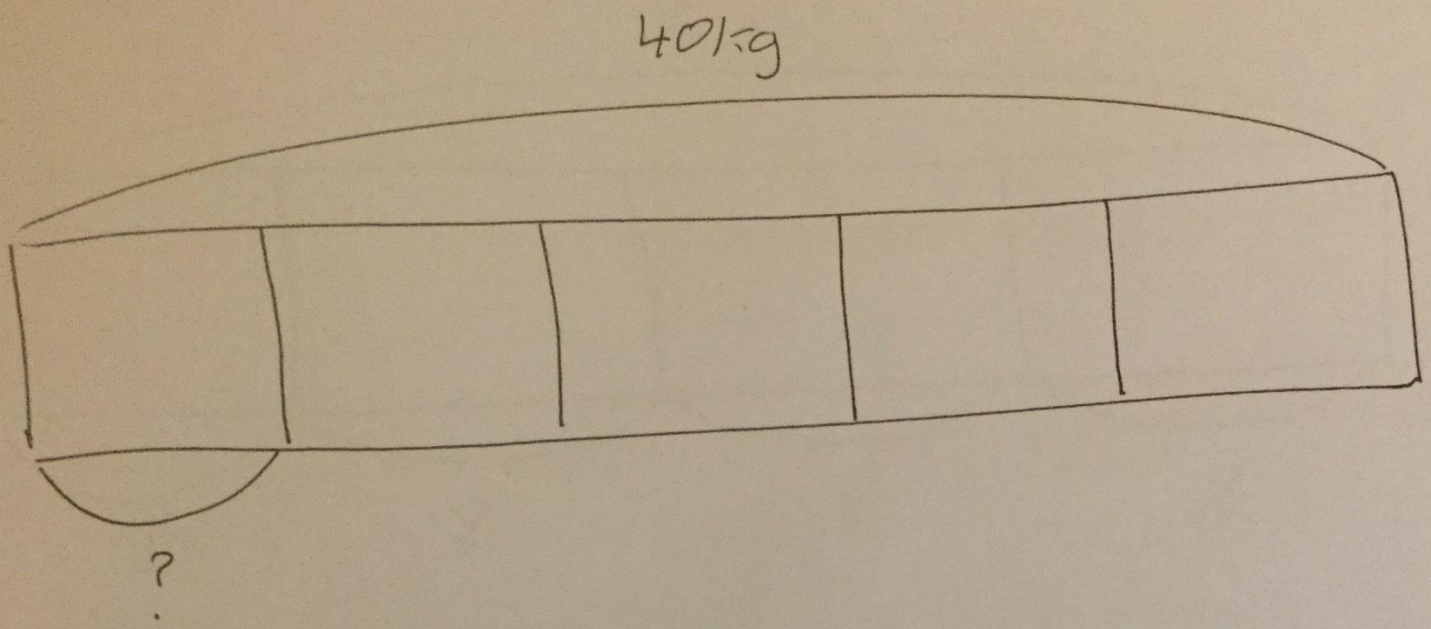
$8 + 8 + 8 + 8 =$

There are ☐ chairs altogether

The total mass of 5 bags of flour is 40 kg.

Each bag of flour has the same mass.

What is the mass of each bag of flour?



$40 \div 5 =$

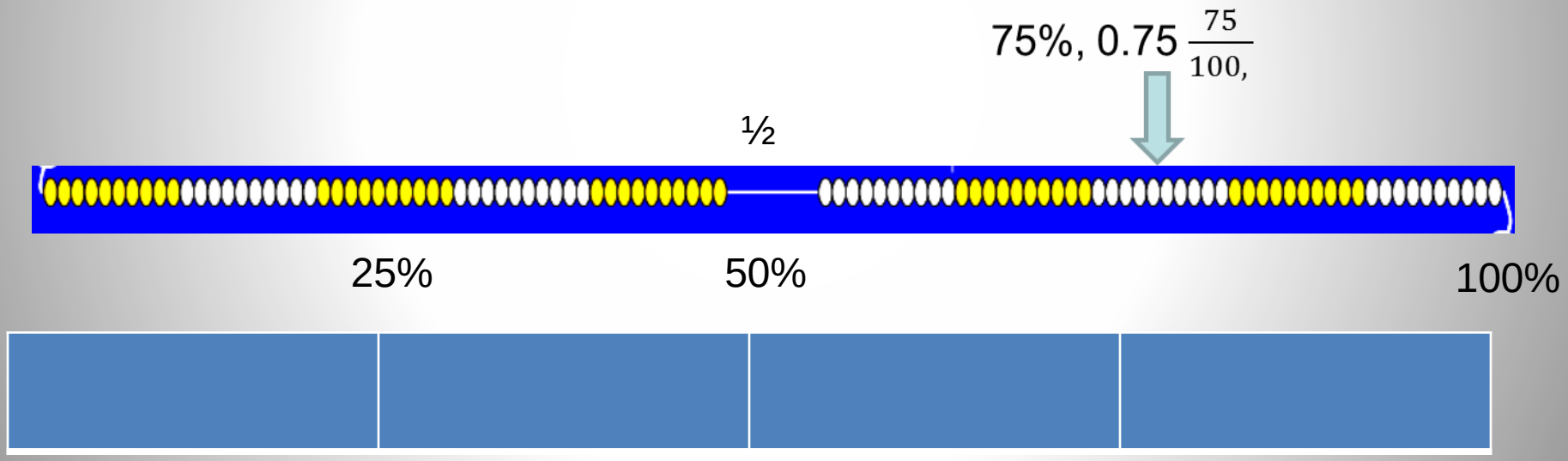
The mass of each bag is $\square$ kg

KS2 barmodelling

$\frac{3}{5}$ of 20 = ?

Fractions, Decimals and Percentages

Bar Modelling can support children to understand the part whole relationships when solving problems involving fractions, decimals and percentages



Children will be familiar with bar model image when downloading apps

Ratio Problems

There are 32 children in a class.

There are 3 times as many boys as girls.

How many girls?

Ratio 3:1

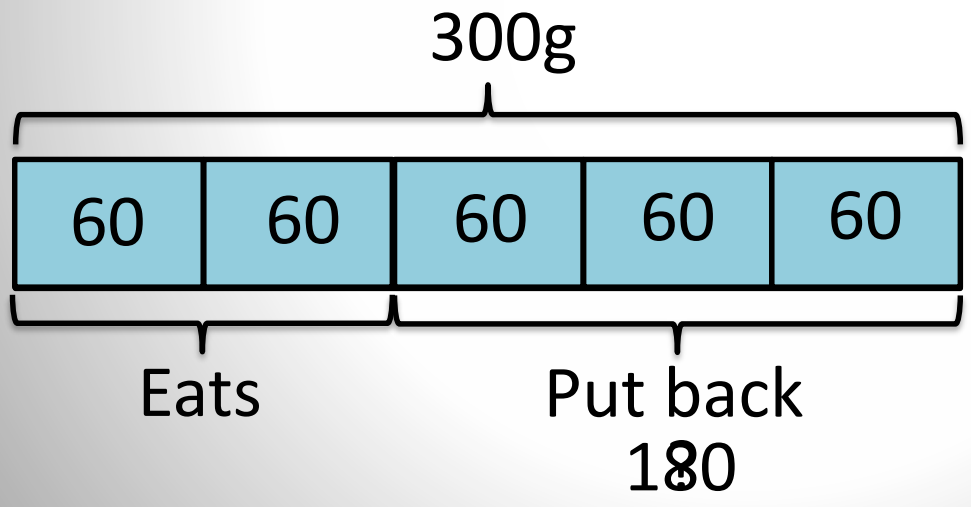
Each part is $\frac{1}{4}$ of 32 = 8, so there are 8 girls

KS2 Bar Modelling

Solve… Matthew has a 300g block of cheese. He eats $\frac{2}{5}$ of the cheese and puts the rest back in the fridge.

How much cheese did Matthew put back in the fridge?

Model



Calculations

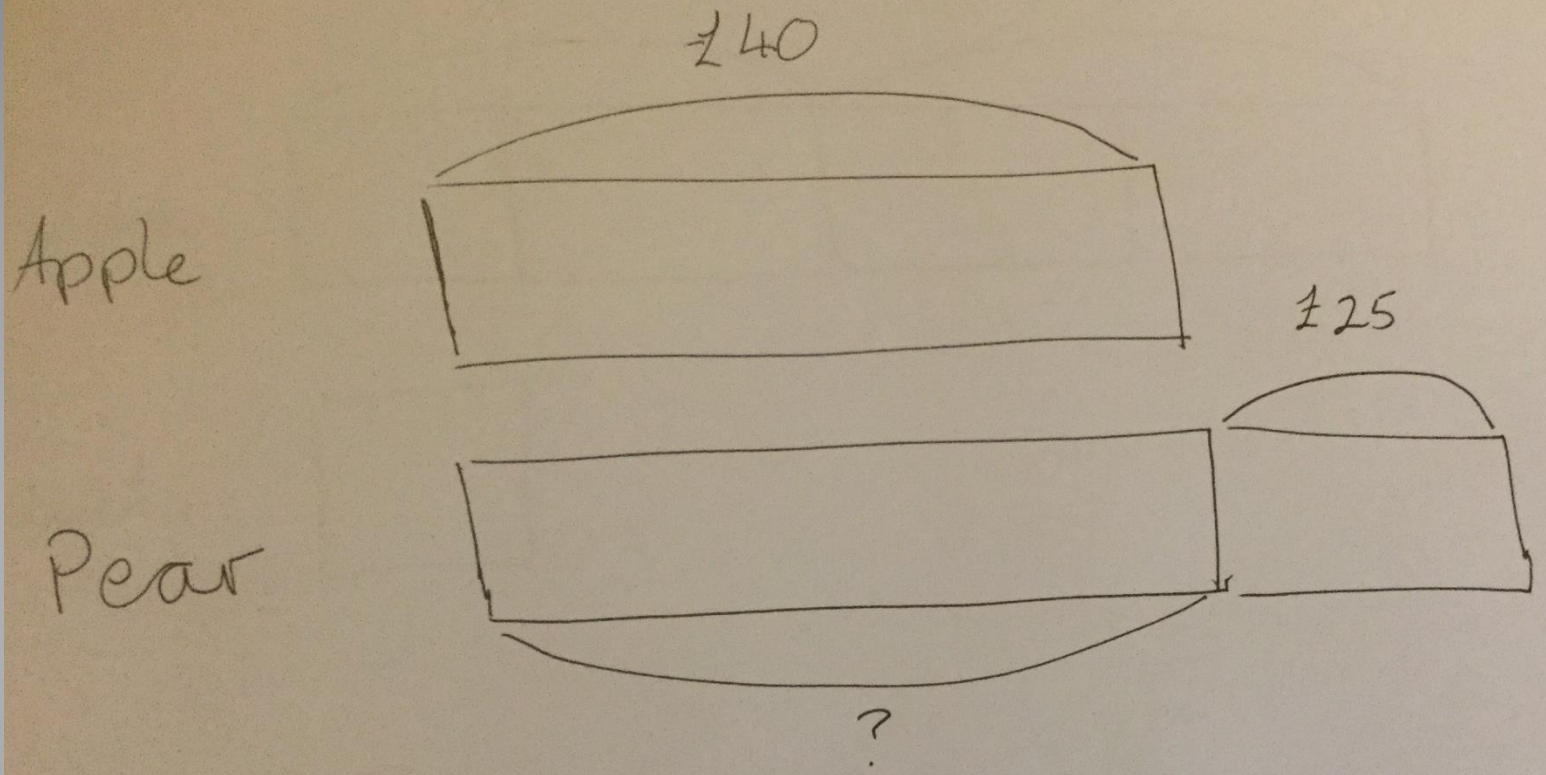
300 ÷ 5 = 60

3 x 60 = 180

Simon likes apples and pears. A cox apple tree costs £40. It costs £25 less than a conference pear tree . How much would he need to spend in total?

Apple tree

Pear tree

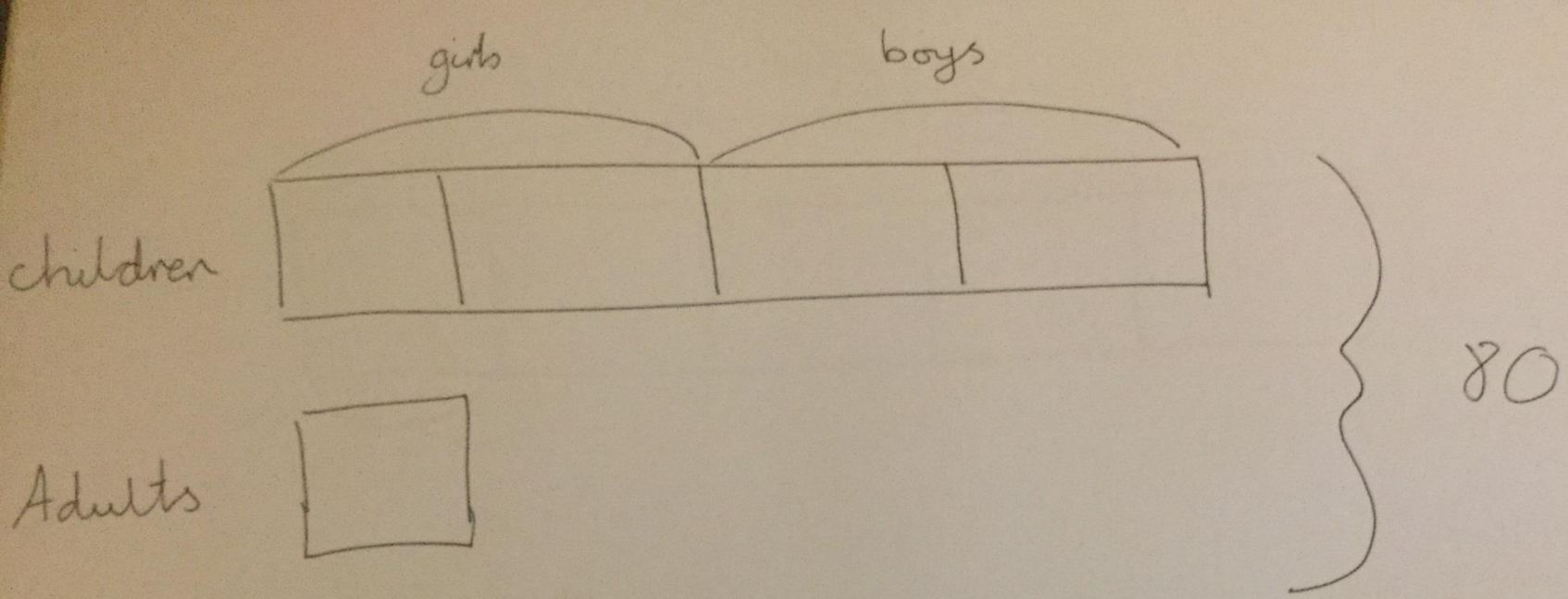


£40 + £40 + £25 = £105

He needs to spend £105 in total

Year 3 Textbook 3A Chapter 4 Lesson 10

There are four times as many children
as there are adults at the Science Museum.
The number of boys is equal to the number of girls.
Altogether, there are 80 visitors at the Science Museum.
How many boys are there at the Science Museum?



$80 \div 5 = 16$

$16 \times 4 = 64$ = number of children

$64 \div 2 = 32$

There are 32 boys at the Science Museum

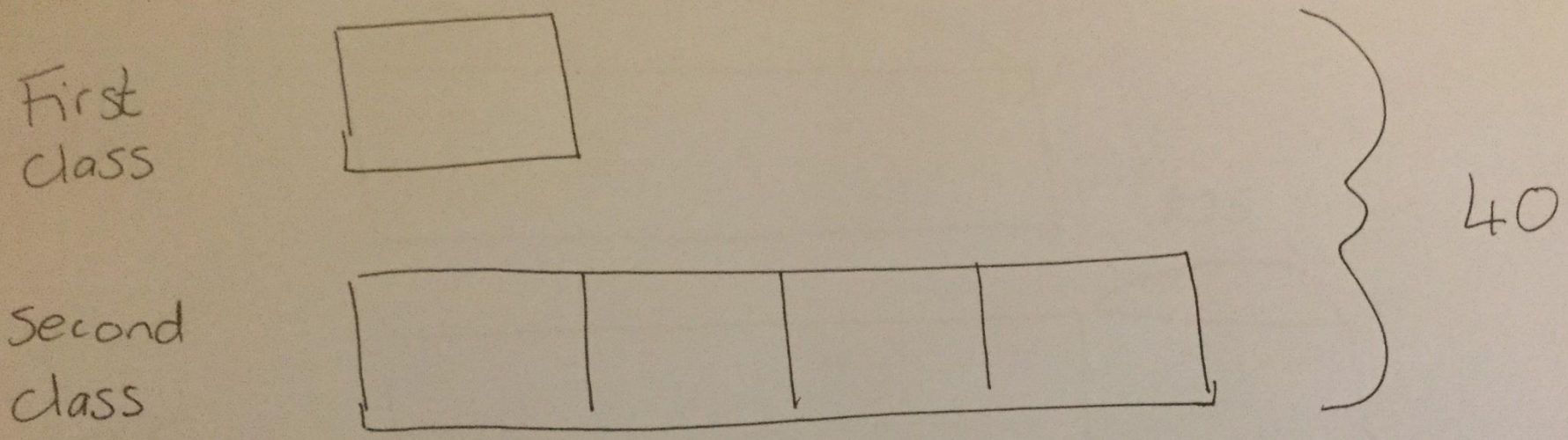
Problem Solving

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?

GCSE higher paper 2012!



$40 \div 5 = 8$

He posts 8 first class letters and 32 second class letters

Year 5 Textbook 5A- C4 L2

2 mixed 1262 g of flour with 1250 g of sugar. The mixture was then used to make 2 cakes.

The mass of the mixture used to make the large cake was 3 times the mass used to make the smaller cake.

Find the mass of the mixture used to make the smaller cake.

2 mixed 1262 g of flour with 1250 g of sugar. The mixture was then used to make 2 cakes.

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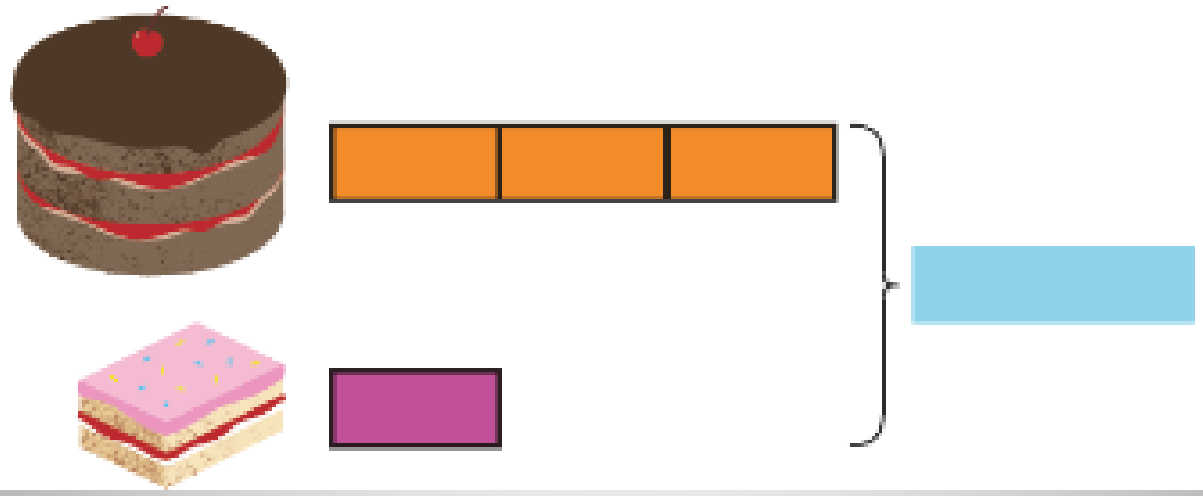
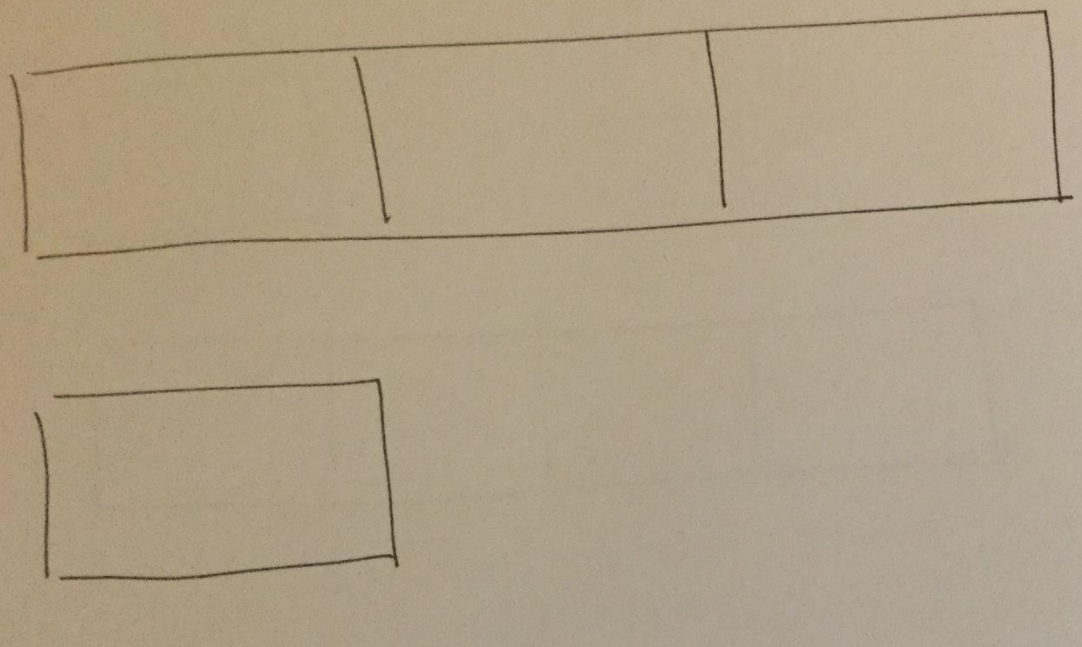
Find the mass of the mixture used to make the smaller cake.





$$\begin{array}{r} 1262\text{g} \\ +\ 1250 \\ \hline 2512\text{g} \end{array}$$

$2512\text{g} \div 4 = 628\text{g}$

The mass of the mixture used to make the smaller cake is 628g