

Objectives for session

- Why we needed a change
 - Philosophy behind the scheme
 - Day-to-day running
 - Impact
-
- Resources
 - Q & A

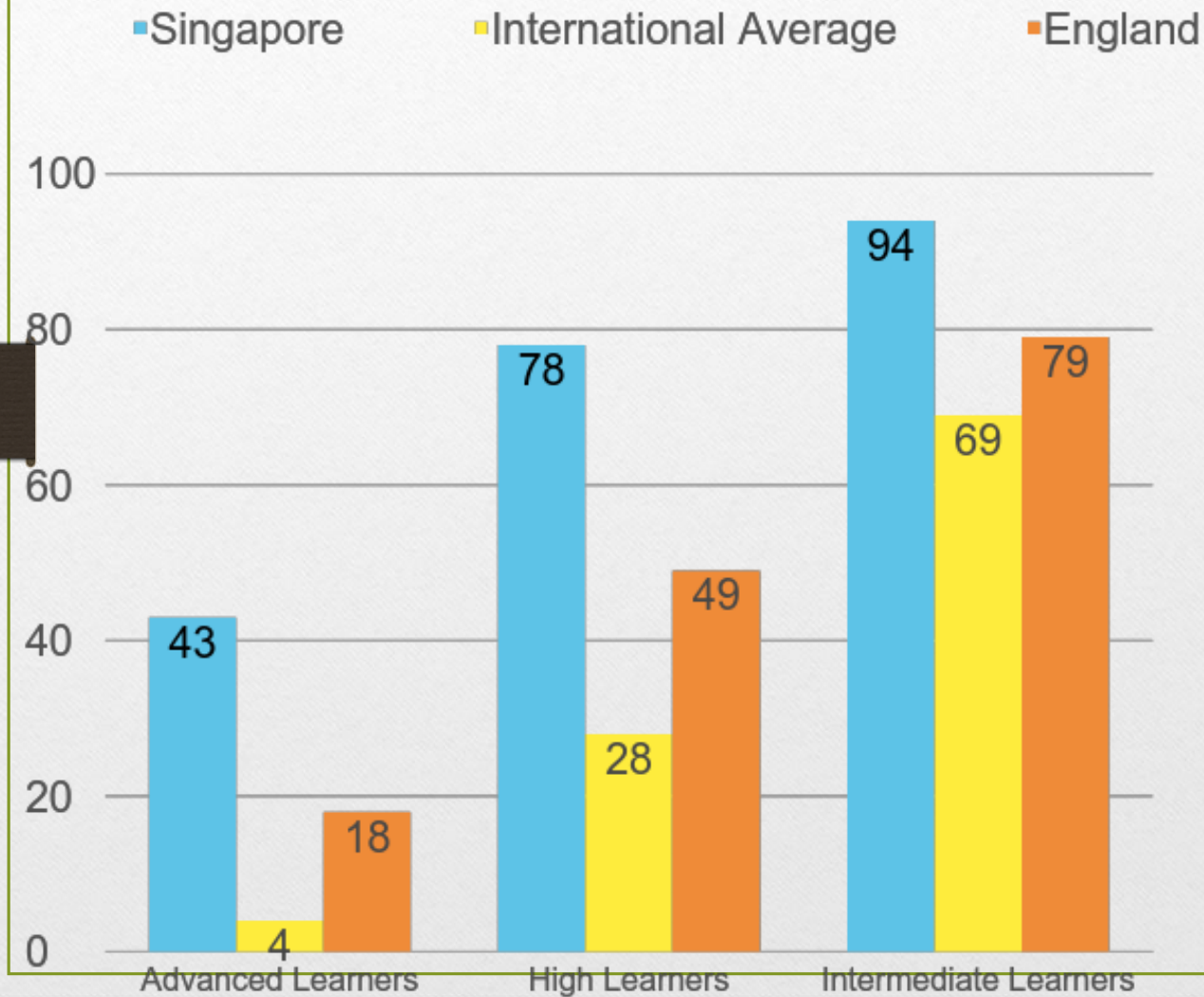
Why we needed a change...

- Our children needed to develop their mental maths and problem solving skills
- New Curriculum and Ofsted framework were introduced, and we needed to provide the children with a 'Mastery' curriculum.
- We knew that we needed something new and exciting that could easily be implemented by all teachers.

So I began researching...



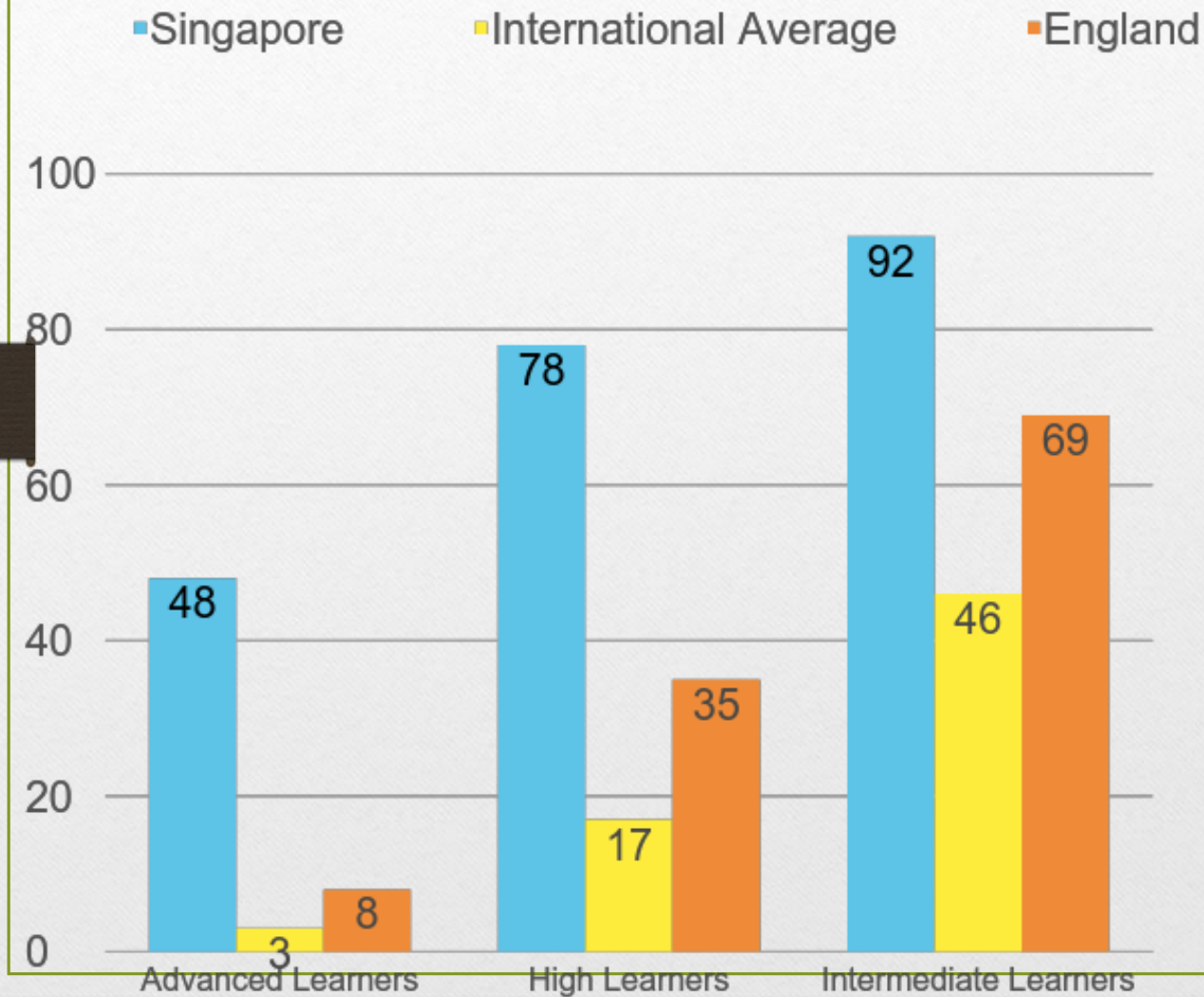
TIMSS Benchmark 2011



Grade 4 is the same age as UK Year 5

Since 1995 Singapore has been at the top of mathematics education

TIMSS Benchmark 2011



Grade 8 is the same age as UK Year 9

Singapore bucks the trend and maintains its high results in Secondary school.

Maths-No Problem!

- Catered to the National Curriculum 2014
- Emphasis is on problem solving and comprehension, allowing students to relate what they learn and to connect knowledge.
- Careful scaffolding of core competencies:
 - visualisation, as a platform for comprehension
 - mental strategies, to develop decision making
 - pattern recognition, to support the ability to make connections and generalise
- Emphasis is on the foundations for learning and not on the content itself so students learn to think mathematically as opposed to merely reciting formulas or procedures.

Maths-No Problem!

- The focus of the scheme is on teaching to mastery, by allowing enough time on a topic for a child to comprehend it thoroughly before moving on.
- The programme emphasises problem-solving and pupils using their core competencies to develop a relational understanding of mathematical concepts.

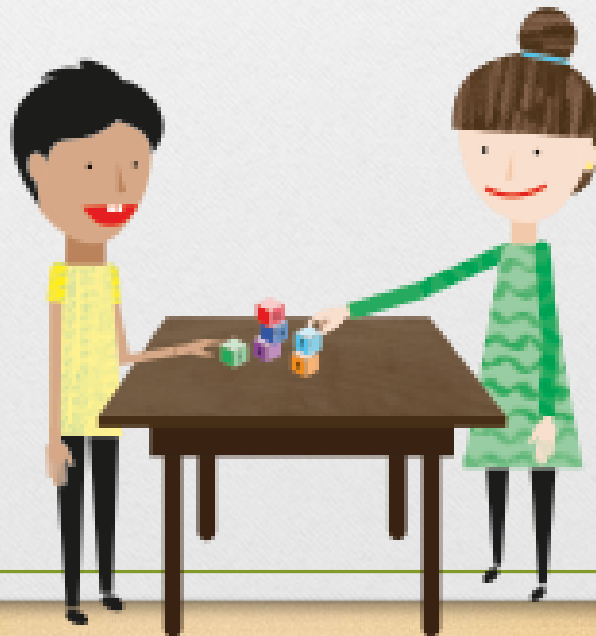
Working with pupils core competencies

Problem solving is at the heart of mathematics

*The focus **is not** on rote procedures, rote memorisation or tedious calculation but on relational understanding.*

Pupils are encouraged to solve problems working with their core competencies, in particular:

- 1 *Visualisation*
- 2 *Generalisation*
- 3 *Make decisions*



An Introduction...

The CPA approach



Concrete representation

- The enactive stage - a student is first introduced to an idea or a skill by acting it out with real objects. 'Hands on'

Pictorial representation

- The iconic stage - a student can now relate the 'hands on' to representations, such as a diagram or picture of the problem.

Abstract representation

- The symbolic stage - a student is now capable of representing problems by using mathematical notation.



Lesson Structure

Most lessons will follow this structure:

Anchor Task: hook, hands-on, practical task to introduce concept.

Structuring: discussion of learning in A.T and modelling of different methods.

Documenting: children recording in their journals their solutions and preferred method

Guided Practice: teacher modelling solving a given problem step-by-step

Independent Practice: children answering workbook questions independently.

Differentiation

Children are expected to complete the same core tasks by the end of a lesson.

Extension takes the form of enrichment rather than acceleration.

Making Number Bonds

Lesson
1

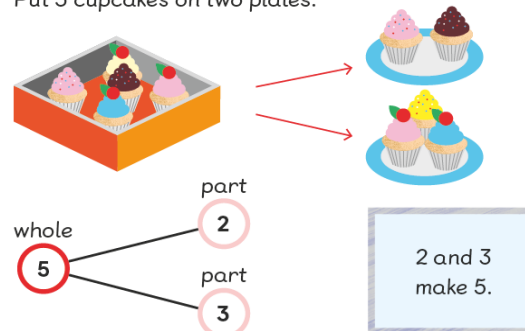
In Focus



How many cupcakes are there on each plate?
Is there another way to put the cupcakes on the two plates?

Let's Learn

- 1 Put 5 cupcakes on two plates.

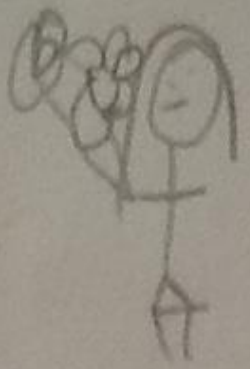
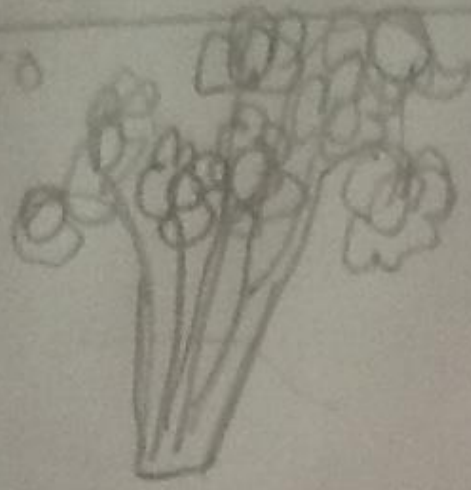


This is a number bond.

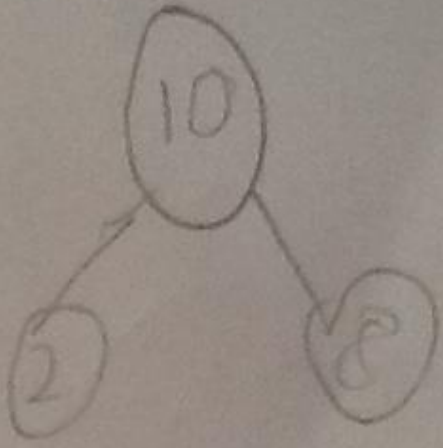
50

Number story

19.05.15



$$\boxed{8} + \boxed{2} = \boxed{10}$$



AS

(I)



Prime and Composite Numbers Mar 11

Learning Goal → identify prime and composite numbers on a hundreds chart.



A prime number is a number with only 2 numbers: 1 and itself.

A composite number is a number with 3 or more factors.

■ = prime

■ = composite

Perfect Square

A number that has a whole number multiplied by itself to equal the number.

- 36
- 1 × 36
 - 2 × 18
 - 3 × 12
 - 4 × 9
 - 6 × 6

Common Factors:
1, 2, 3, 4, 6, 12
∴ G.C.F. = 12

- 48
- 1 × 48
 - 2 × 24
 - 3 × 16
 - 4 × 12
 - 6 × 8

Common factors are factors that are shared between two lists of factors.

G.C.F. - Greatest Common Factor - the greatest (or highest) number in a list of common factors.

Equivalent Fractions

June 8th

Learning Goal: we will show the things that are the same between fractions, and show and compare fractional results with different denominators.

What I Know: I know how to make equivalent fraction.

What I learned: I learned that when you're making equivalent fractions, it's easier when they're multiples.

example $\frac{3}{6}$ $\frac{4}{12}$ $\frac{1}{2}$ $\frac{5}{10}$ $\frac{2}{4}$

Proof: $\frac{3}{4} = \frac{7}{8} = \frac{4}{10}$ I solved this by looking at the denominators to figure out what you multiply to get that number then I multiplied the numerator by the number the denominator was divided by.

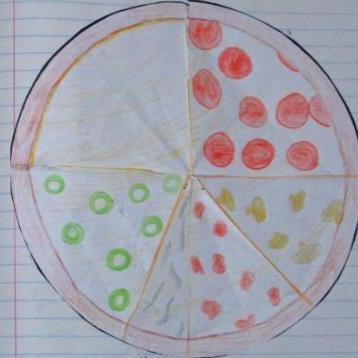
Reflection:



Equivalent Fractions

June 8th

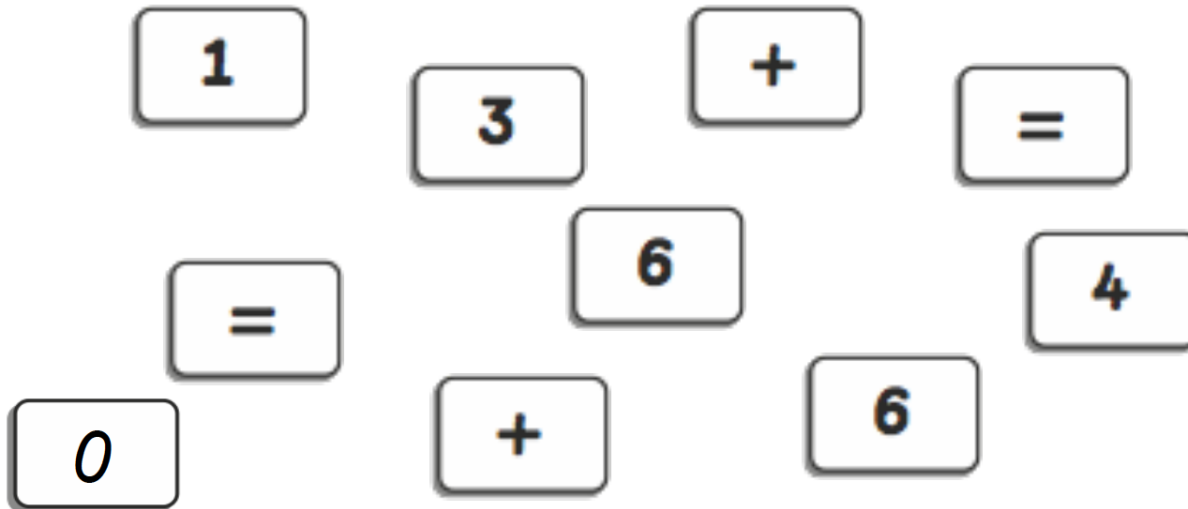
Learning Goal: we will represent the relationship between fractions. We will represent and compare fractional results with unlike denominators.



* Make a pizza that is:
1/10 cheese, 1/10 mushroom, 1/10 anchovy, 1/10 pepperoni, 1/10 sausage, 3/10 olives

Example of a practice lesson

Mind Workout 



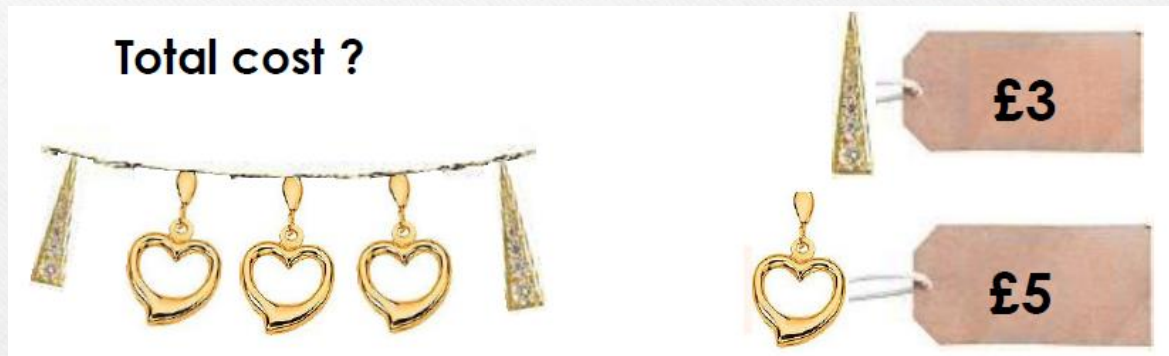
Make two addition equations

Use all the cards shown

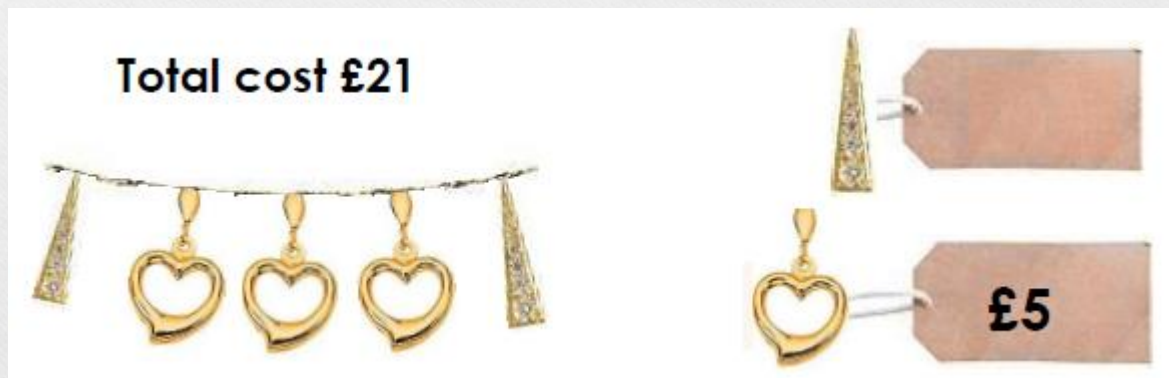
Deepening a problem

With your partner, decide which version involves deeper problem-solving skills and why.

Version 1



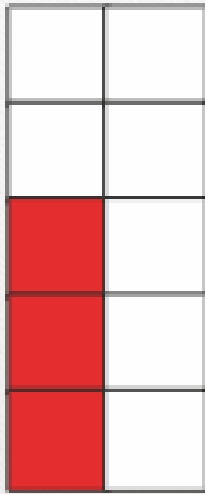
Version 2



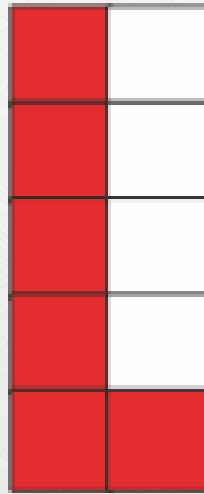
Ten Frames



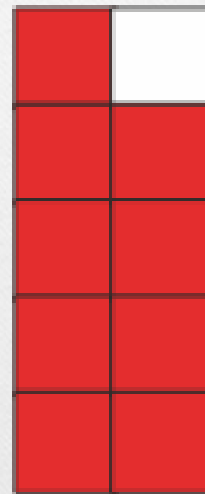
Use of the ten frames



3

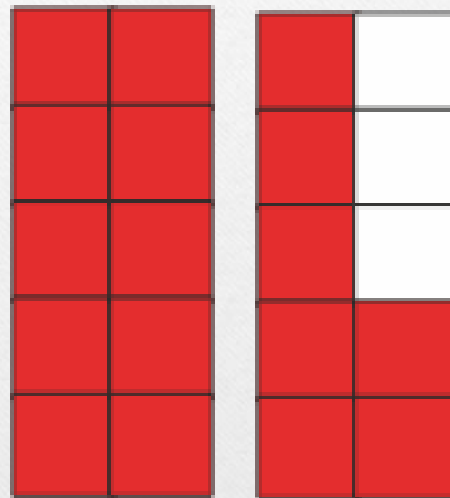


6



9

Use of the ten frames



10

7

17

Use of the ten frames



Counting Objects to 10

Lesson
2

In Focus

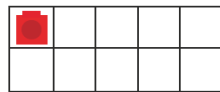
Count.
How many  are there?



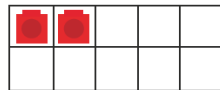
Show the numbers on  using .



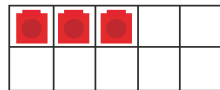
Let's Learn



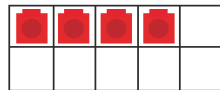
1



2



3



4

- 1 The 10 frame appears early in year 1.
- 2 Initially it is used as a pictorial model to represent numbers up to 10

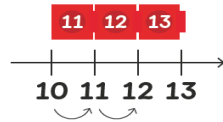
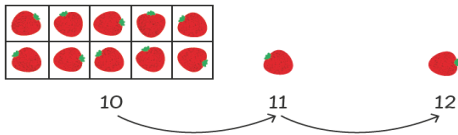
Use of the ten frames

Let's Learn

- 1 How many strawberries are there?



Make 10 and count on.



10 and 2 make 12.

$$10 + 2 = 12$$

There are 12 strawberries.

1

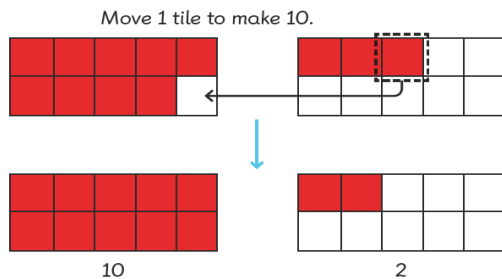
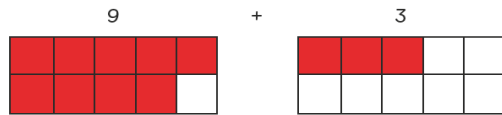
It reappears later when we get to counting to 20.

2

It is used to help pupils recognise that 10 ones can be renamed to 1 ten, introducing the concept of place value.

Use of the ten frames

2 $9 + 3 = ?$



$9 + 3 = 12$

$9 + 3$
① ②
 $9 + 1 = 10$
 $10 + 2 = 12$

Is $9 + 3$ the same as $3 + 9$?
Why?

1

It is used for adding numbers up to 20

2

Alongside the number-bond diagram it helps build a mental model to develop a strong number sense which is later used as a platform for making decisions.

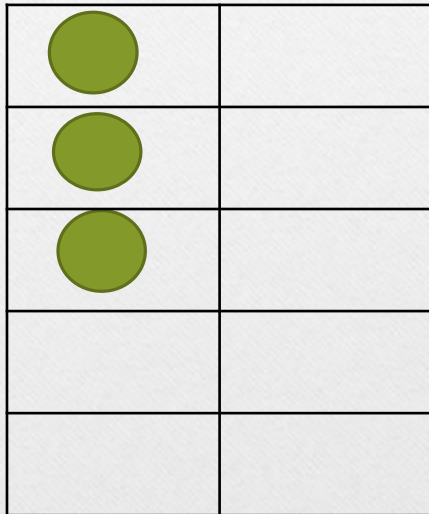
Use of the ten frames

How to play:

Pick a ten frame card at random and show it to the learner for 5 seconds. Then remove it and ask them to reproduce the image on their blank ten-frame using the counters.

Can they tell you how many counters there are? Can they tell you how many spaces there are?

Can they make a number story linking the two?



Using ten frames to support counting and place value

Open discussion

- 1 How do ten frames help children with numbers ?
- 2 How do ten frames help children develop a sense of place value ?

Add three numbers

Add three numbers

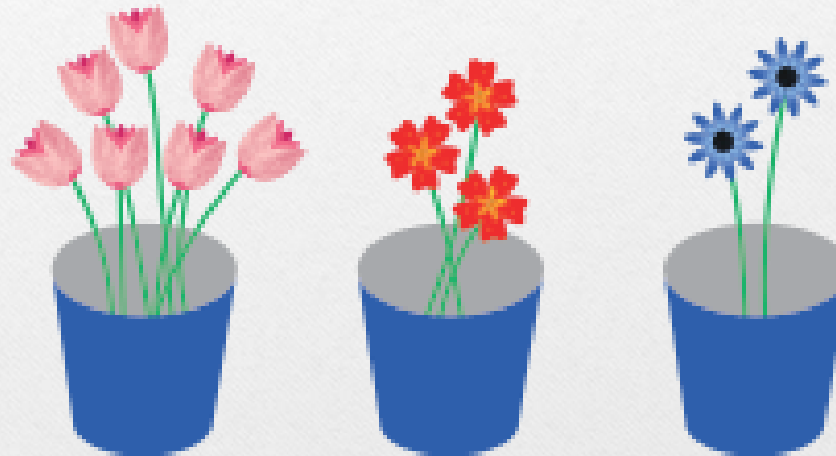
In focus



Add three numbers

Add three numbers

In focus



Can you add to find out how many flowers there are in total?

Add three numbers

Let's Learn

1 Add 7, 3 and 2.

Method 1

Make 10.

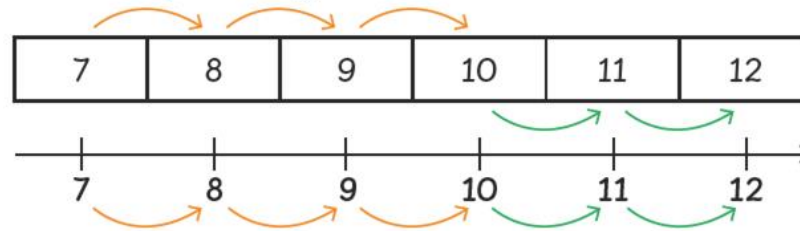
7 and 3 make 10.

$$\begin{aligned}7 + 3 + 2 &= 10 + 2 \\ &= 12\end{aligned}$$



Method 2

Add by counting on.



2 Add 9, 9 and 8.

$$9 + 9 + 8 = 26$$

$$\begin{aligned}9 + 9 &= 18 \\ 18 + 8 &= 26\end{aligned}$$



Add three numbers

Guided Practice

1 Make 10 and add.

$$\begin{aligned} \text{(a)} \quad 2 + 8 + 4 &= \square + \square \\ &= \square \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad 3 + 9 + 1 &= \square + \square \\ &= \square \end{aligned}$$

2 Add.

$$\text{(a)} \quad 6 + 7 + 4 = \square$$

$$\text{(b)} \quad 9 + 0 + 4 = \square$$

$$\text{(c)} \quad 8 + 5 + 9 = \square$$

$$\text{(d)} \quad 7 + 9 + 6 = \square$$

Activity Time

Work in groups

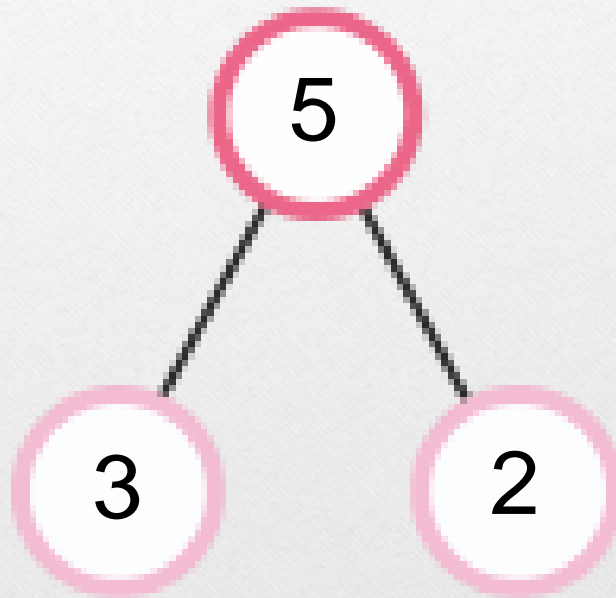


- ① Place the cards on the boxes
- ② Arrange so the sum of the horizontal numbers is equal to the sum of the vertical numbers

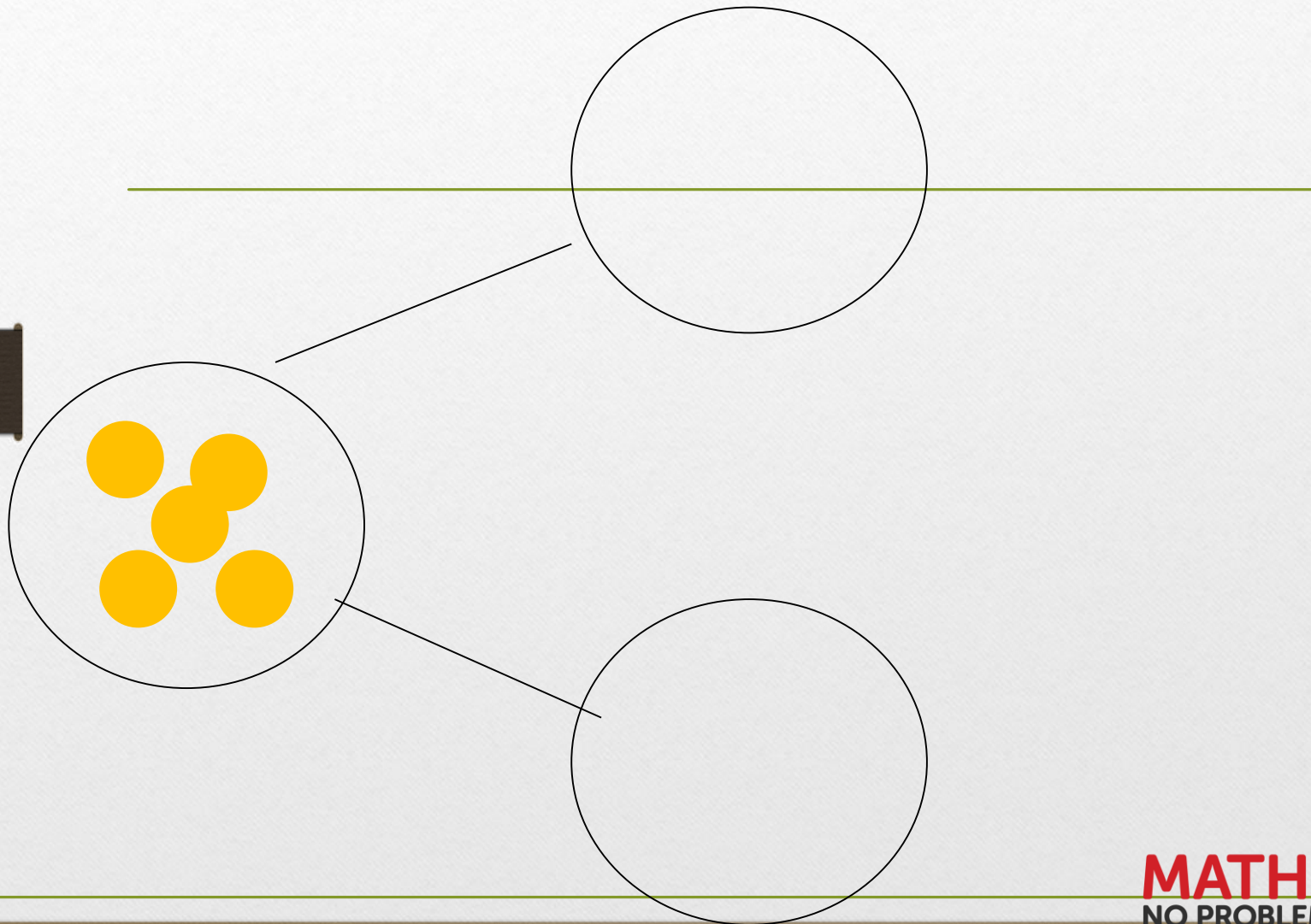
Number Bonds



Use of number bonds and the
number bond diagram



Partitioning



Making number bonds

Lesson 1

In focus



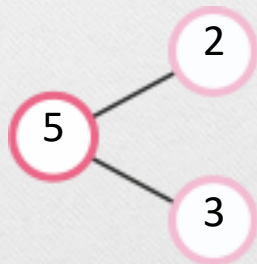
How many cupcakes are there on each plate?

Is there another way to put the cupcakes on the two plates?

Making number bonds

Let's Learn

1

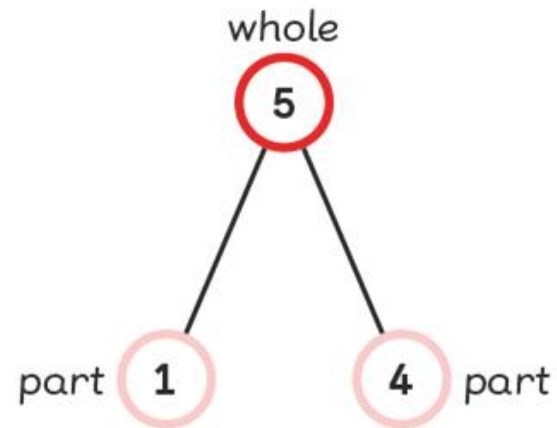
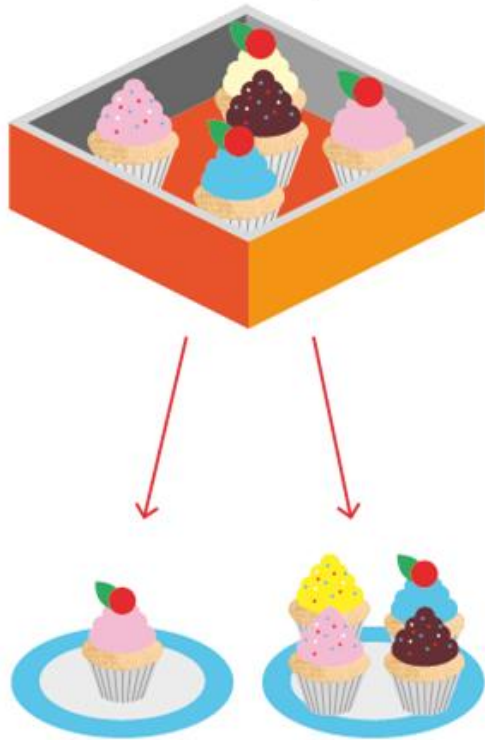


2 and 3 make
5

This is a **number bond**

Making number bonds

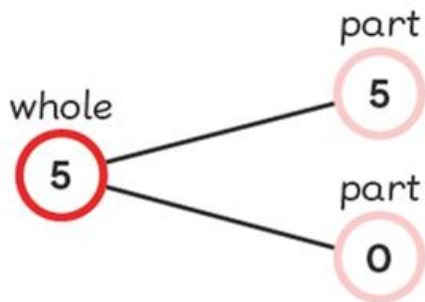
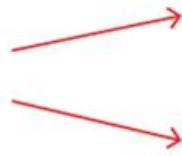
2 There are other ways to make 5.



1 and 4
make 5.

Making number bonds

3





5 and 0
make 5.



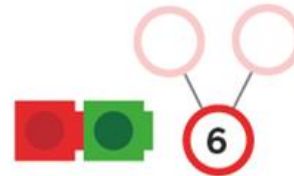
Making number bonds

Activity
Time

Work in groups of 4.

- ① Make number bonds of 6.
- ② Put  on the  to show different ways to make 6.
- ③ Take turns to make number bonds for different numbers.

What you need:






How many number bonds can you make?







Making number bonds

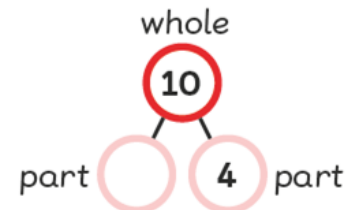
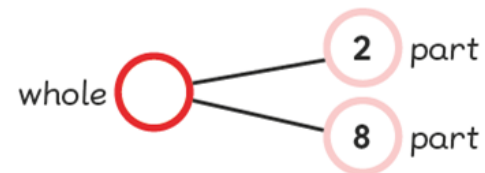
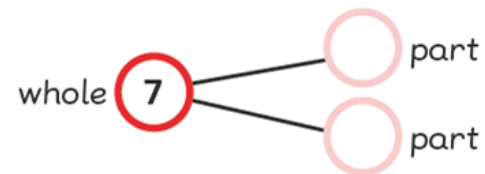
Guided Practice

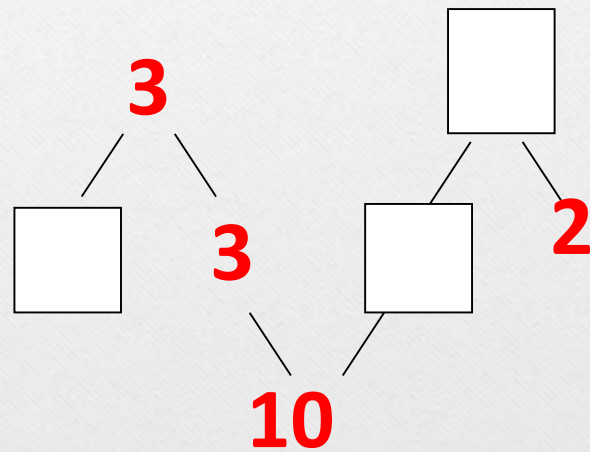
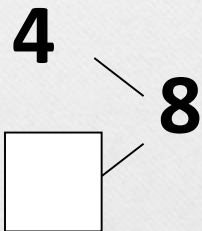
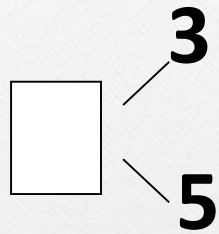
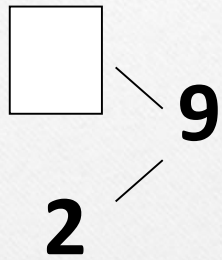
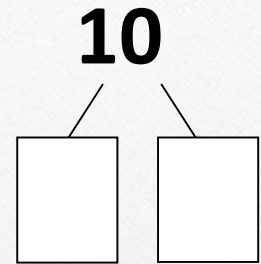
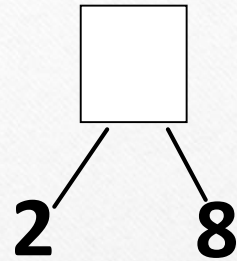
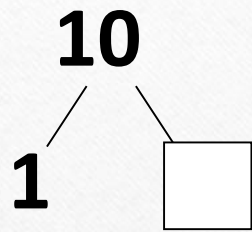
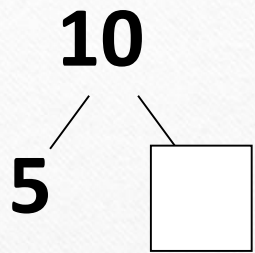
Complete the number bonds.

(a) 
 and  make 7.

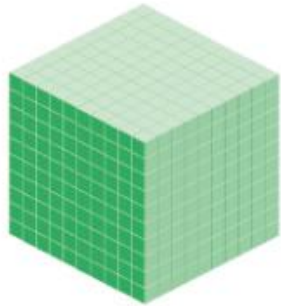
(b) 
2 and 8 make .

(c) 
4 and  make 10.



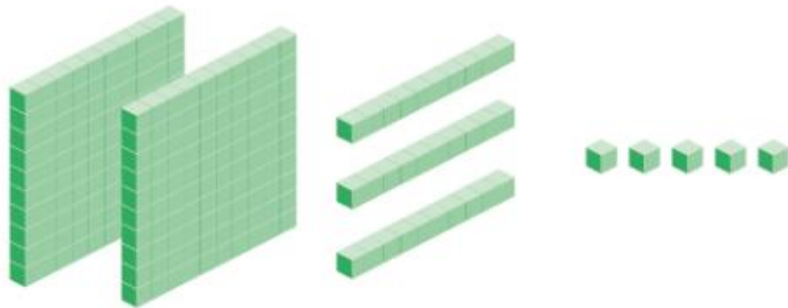


In Focus



represents 1.

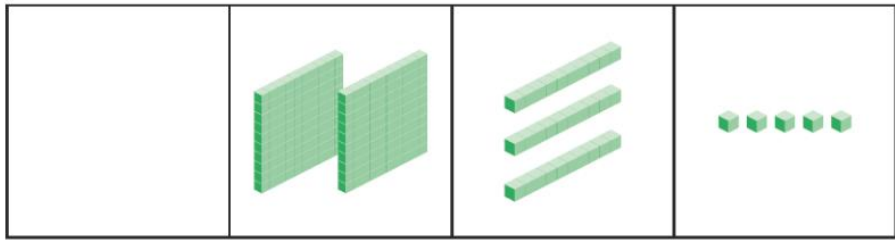
What number does this represent?



What other numbers can you represent using 10 pieces of



4

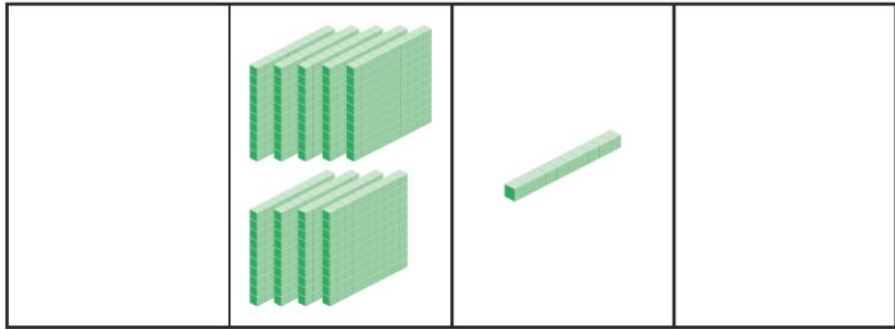


This represents 0.235.

0.235

This digit is in the tenths place. ←
This digit is in the hundredths place. ←
This digit is in the thousandths place. ←

5



This represents 0.91.

0.91

9 tenths ←
1 hundredth ←

91 hundredths



Problem Solving

The Bar Model



Foundations for the Bar Model

Concrete — modelling with real objects

- 1 Based on Jerome Bruner's theory of representations, students first start by acting out problems with the real objects. When the problem is counting apples, the children should be counting real apples.



2 Count.

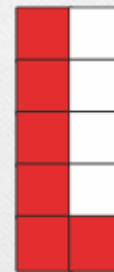
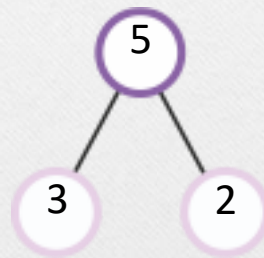


- cups
- eggs
- pastries
- apples
- slices of bread
- children
- boys

Foundations for the Bar Model



Representation — modelling with different objects

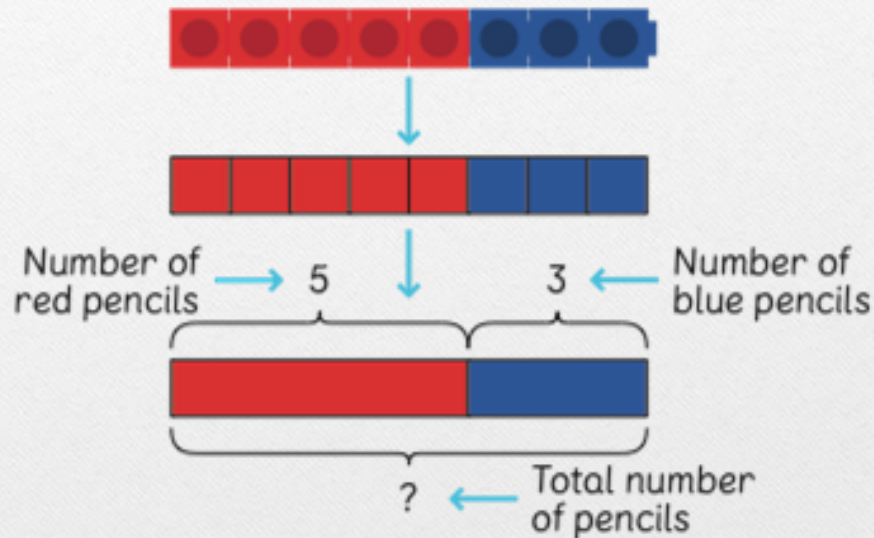
- 2 Moving away from always dealing with the real objects we can now start to model situations with other objects, for example counters, or with pictorial representations.



Bar Model

Transition to the bar model

- 1 Use   to show the number of pencils.



$$5 + 3 = 8 \text{ or } 3 + 5 = 8$$


There are 8 pencils altogether.


Draw bars to show each number.






Bar Model

Transition to the bar model

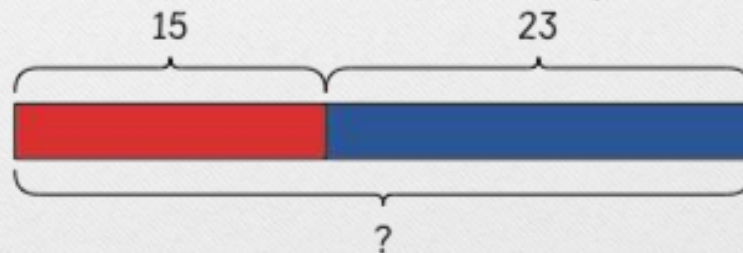
2  has 15 pencils.

 has 23 pencils.

There is not enough space to use  !



How many pencils do they have altogether?



$$15 + 23 = 38$$

They have 38 pencils altogether.

	T	O
	1	5
+	2	3
<hr/>		
	3	8
<hr/>		

Introduction of the Bar Model

- 1 Students are introduced to the bar model method in year 2, first as a means to solve word problems in length and mass.
- 2 Although students will only see the bar model in year 2 for the first time, the foundations have been laid in previous years with the ground work done on part-part-whole relationships and comparisons using concrete objects and more 'concrete' pictorial representations.
- 3 The bar model is used to solve problems using addition, subtraction, multiplication and division.

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?

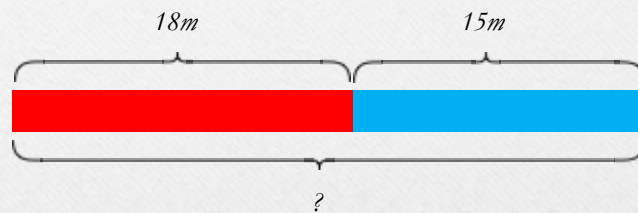
Show
your
working



Bar Model

Solving word problems — length

Emma buys 18m of red cloth and 15 m of blue cloth
What is the total length of cloth that she buys?



Emma buys  cloth altogether.

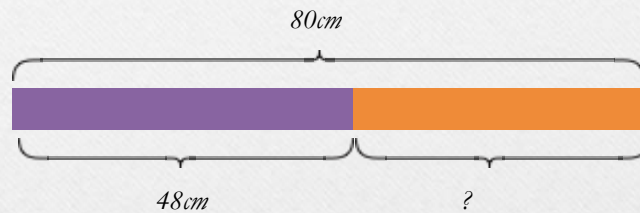
*Should we add
or subtract?*



Bar Model

Solving word problems — length

Ruby has a ribbon that is 80 cm long.
She cuts a piece that is 48 cm long to make a bow.
What is the length of ribbon left?



$$\square \bigcirc \square = \square$$

The length of ribbon left is \square .

*What equation
can we write?*



Progression in Bar Model

Reception- Modelling with real things- concrete

Modelling with copies of things

Modelling with pictures= abstract concrete

Linking problems with stories

Year 1

Modelling with counters/multilink

Drawing using squares with 1 square representing 1 object (discrete counting)

Making up stories to represent problems

Year 2

Single step problems

Part – whole

Comparison (addition and subtraction: More than/less than problems)

Multistep problems

Progression in Bar Model

Year 3 and 4

All operations in all formats

Before/After problems

Model Unknowns

Year 5

Fractions/percentages and ratios

Year 6

All complex problems



Impact

- All classes are receiving a practical and well-pitched curriculum
- Teachers' planning in Maths has been reduced to allow them to spend more time preparing directly for the lessons
- Practice is consistent across the school
- Schools who have implemented the scheme previously have seen results and the quality of Mathematics improve greatly.

Wow!

- Website <http://teacher.mathsnoproblem.co.uk/year-6-teacher-edition/#24273367>
- Textbooks
- Workbooks

A bit of an insight into the theory

- A series of Parents videos are available on our website which explain the way in which we will use the scheme to teach key concepts.
- Let's look at a couple of examples now...

<http://www.stpeters.lancs.sch.uk/maths/>

The image features a central graphic consisting of several concentric circles. The innermost circle is a solid dark blue. This is surrounded by a ring of bright red, followed by a ring of dark red, and then a ring of black. The text "That's all Folks!" is written in a white, elegant cursive font across the middle of the graphic, with the words "That's all" on the top line and "Folks!" on the bottom line. Below this, the text "Any Question?" is also written in the same white cursive font, centered under the first line. The entire graphic is set against a light beige background with a subtle texture. A dark grey horizontal bar is visible behind the graphic, extending across the width of the image.

That's all Folks!
Any Question?