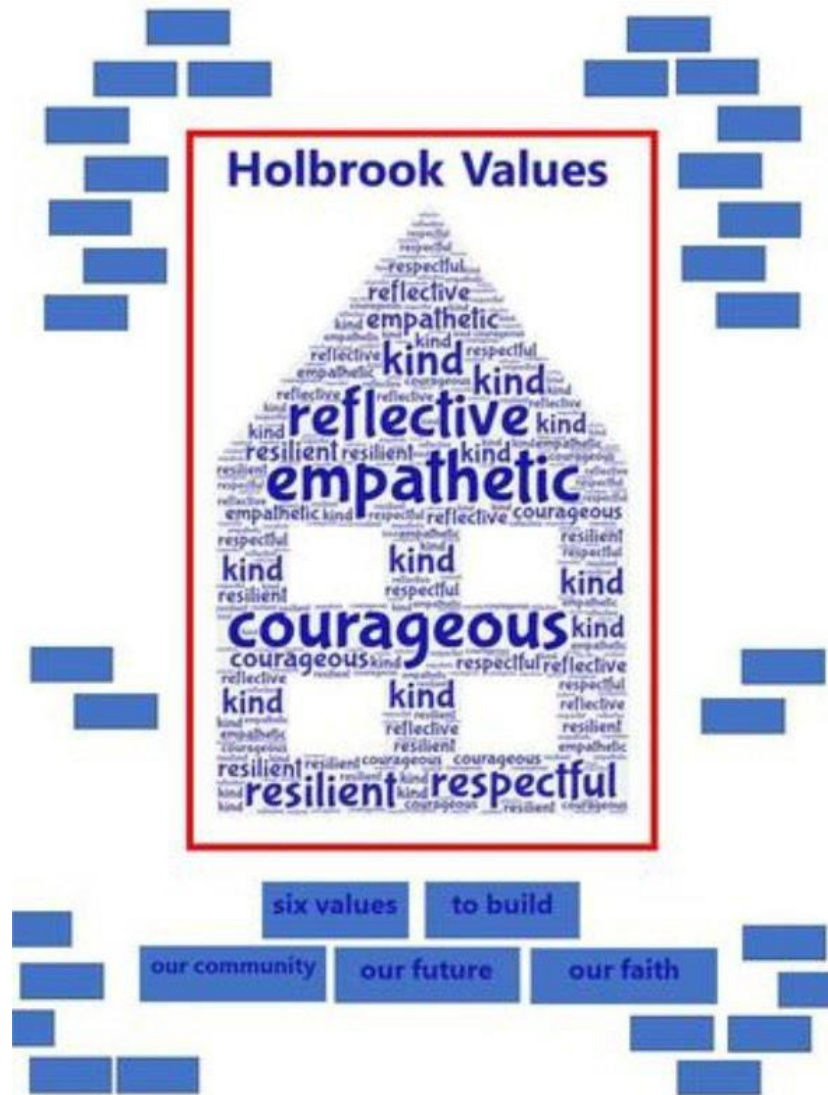




MATHS MASTERY PARENTS' INFORMATION EVENING 2023

Holbrook C of E Primary School

THANK YOU FOR ATTENDING



Our learning at Holbrook C of E Primary School is based around our school values and:

- A commitment to academic excellence
- Increasing children's cultural capital through rich learning experiences
- Celebrating and encouraging creativity
- Teaching the necessary skills and attitudes for effective, sustained, independent learning



3 TYPES OF LEARNING

There are three types of learning:

1. Shallow learning – surface, temporary, often lost
2. Deep learning – it sticks, can be recalled and used
3. Deepest learning – can be transferred and applied in different contexts

“In mathematics, you know you’ve mastered something when you can apply it to a totally new problem in an unfamiliar situation.” – Dr Helen Drury, Director of Mathematics Mastery.

The idea of mastery learning goes back to the 1960s, when Benjamin Bloom, an American educational psychologist had a 'novel' idea: if learners don't get something the first time, then teach them again and in different ways until they do. More recently, the Ark Academy Chain began to develop a maths curriculum influenced by Singapore. Pupils in South Asian schools are renowned for their academic prowess.

In 2011, the term “mathematics mastery” was adopted with the hope of improving pupils' performance here in the U.K..



BACKGROUND OF MATHS MASTERY



Mathematics programmes of study: key stages 1 and 2

National curriculum in England

September 2013

NATIONAL CURRICULUM

The expectation is that the majority of pupils will move through the programmes of study broadly at the same pace. Progression should always be based on the security of the pupils' understanding and their readiness to move onto the next stage.

Pupils who grasp concepts should be challenged through rich and sophisticated problems before any acceleration through new content. Those pupils who are not sufficiently fluent with their material should consolidate their understanding, with additional practice, before moving on.

THE ESSENCE OF MATHS TEACHING FOR MASTERY

- Maths teaching for mastery rejects the idea that a large proportion of people just ‘can’t do maths’.
- All pupils are encouraged by the belief that by working hard at maths they can succeed.
- Pupils are taught through whole-class interactive teaching, where the focus is on **all** pupils working together on the same lesson content at the same time. This ensures that all can master concepts before moving to the next part of the curriculum sequence, allowing no pupil to be left behind.

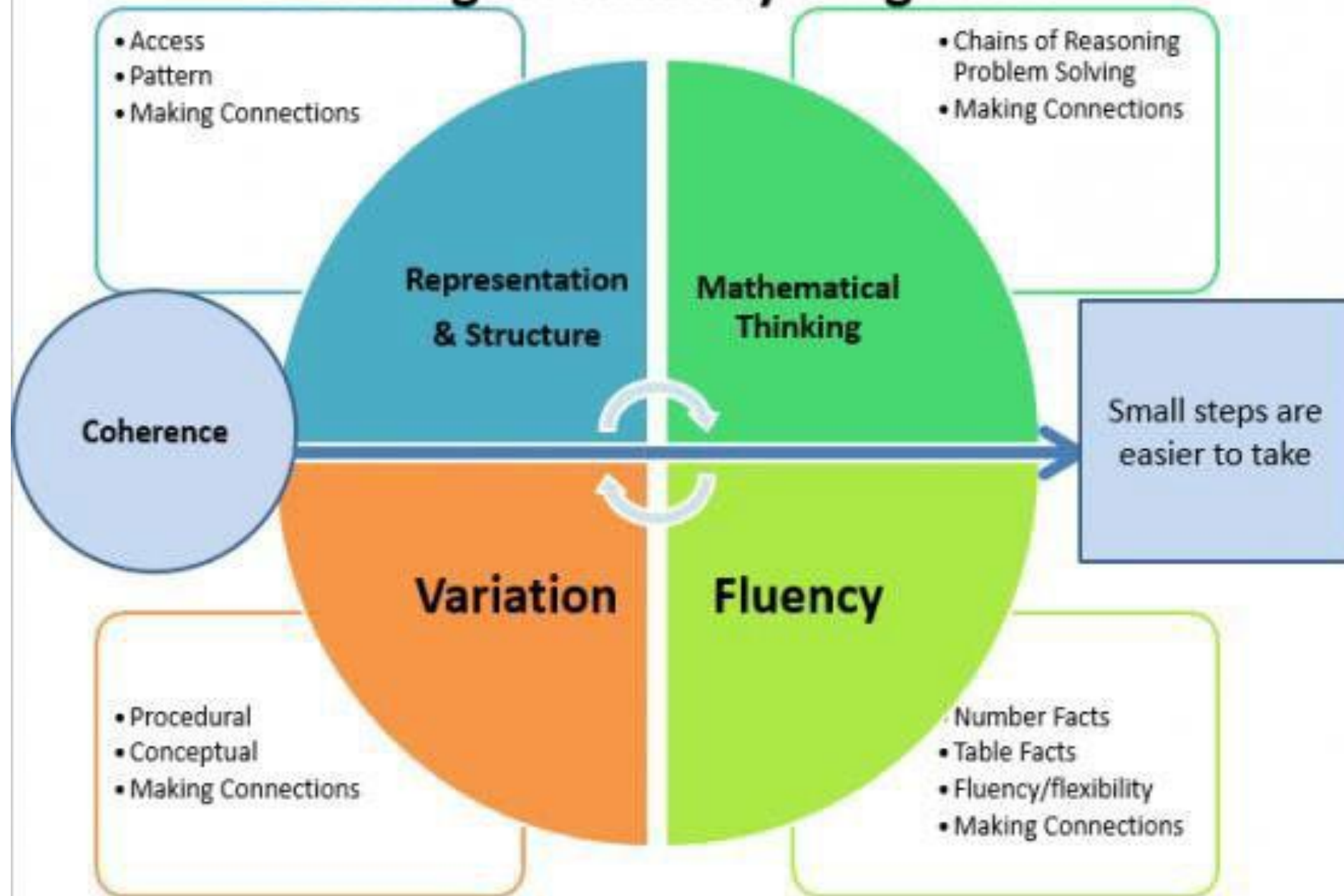


THE ESSENCE OF MATHS TEACHING FOR MASTERY

- It is recognised that practice is a vital part of learning, but the practice used is intelligent practice that both reinforces pupils' procedural fluency and develops their conceptual understanding.
- Significant time is spent developing deep knowledge of the key ideas that are needed to underpin future learning.



Teaching for Mastery 5 big ideas



Small steps

Step 1 Count within 20

Step 2 Understand 10

Step 3 Understand 11, 12 and 13

Step 4 Understand 14, 15 and 16

Step 5 Understand 17, 18 and 19

Step 6 Understand 20

Step 7 1 more and 1 less

Step 8 The number line to 20

Step 9 Use a number line to 20

Step 10 Estimate on a number line to 20

Step 11 Compare numbers to 20

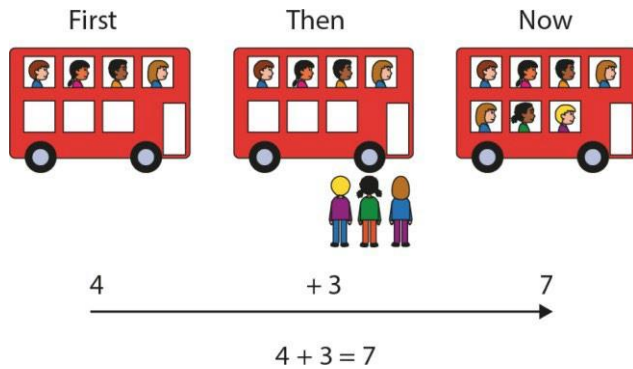
Step 12 Order numbers to 20

COHERENCE

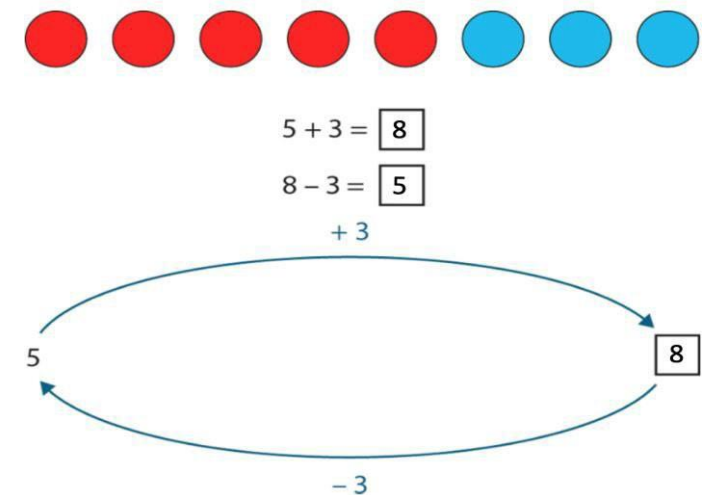
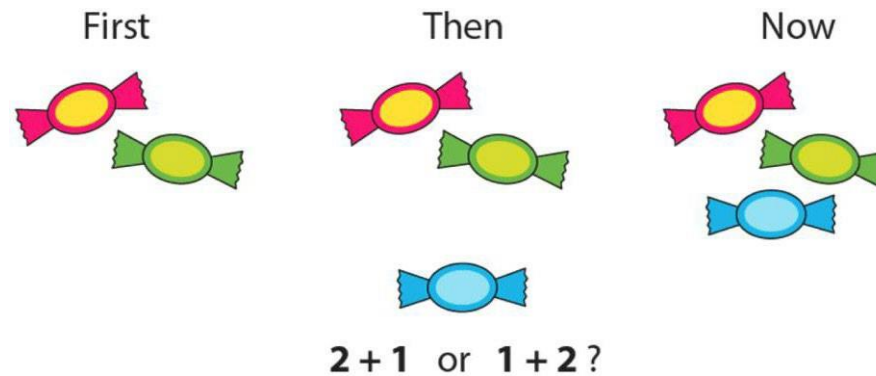
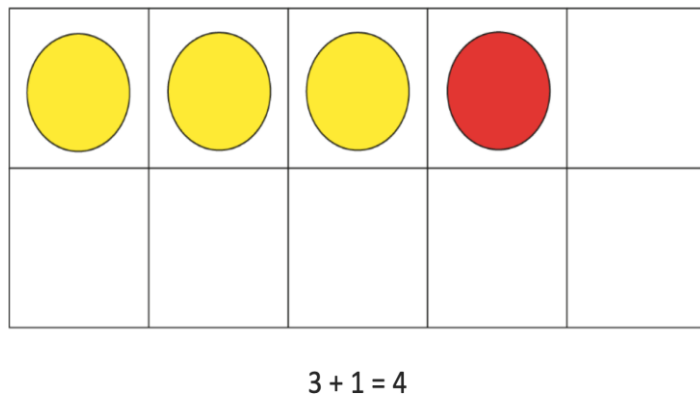
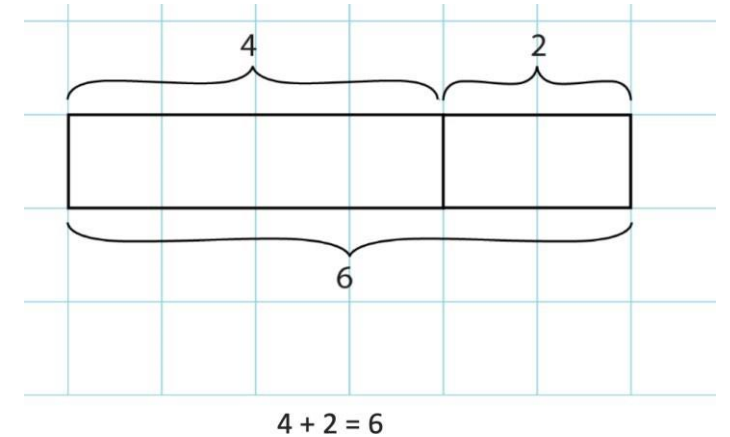
Lessons are broken down into small connected steps that gradually unfold the concept, providing access for all children and leading to a generalisation of the concept and the ability to apply the concept to a range of contexts (NCETM, 2019).

The objective is covered over 12 small steps.

REPRESENTATION AND STRUCTURE



Representations used in lessons expose the mathematical structure being taught, the aim being that students can do the maths without recourse to the representation (NCETM, 2019).

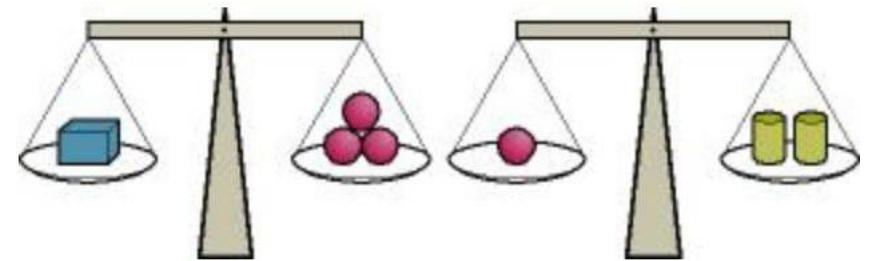


MATHEMATICAL THINKING

If taught ideas are to be understood deeply, they must not merely be passively received but must be worked on by the student: thought about, reasoned with and discussed with others (NCETM, 2019).

▲	♣	▲	○	<input type="text"/>
♣	○	♣	▲	25
○	○	○	○	20
▲	♣	♣	▲	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	26	

Each shape stands for a number. The numbers shown are the totals of the line of four numbers in the row or column. Find the remaining totals.



From the information shown on the scales, can you work out which object weighs the least?

Times Tables Challenge:

Name: _____ Date: _____

x	5	9	2	11	8	1	12	3	4	6	10	7
8												
7												
11												
9												
12												
6												
2												
1												
4												
10												
3												
5												

FLUENCY

Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics (NCETM, 2019).

The National Curriculum states that pupils should become fluent in the fundamentals of mathematics through varied and frequent practice. An example of this is the new Year 4 times table testing. While a part of this is about knowing key mathematical facts and recalling them efficiently, fluency means so much more.

Fluency gives pupils the ability to delve deeper into maths; to develop number sense and choose the most appropriate method for the task at hand; to be able to apply a skill to multiple contexts

(Third Space Learning, 2019).

			8 + 8		
		10 + 6	11 + 5	9 + 7	
7 + 9	12 + 4	3 + 3	14 + 2	5 + 11	
15 + 1	6 + 10	2 + 4	13 + 3	3 + 13	
	16 + 0	8 + 8	1 + 15		
		6 + 2			
		2 + 6			
5 + 3		1 + 7		3 + 5	
	8 + 0	4 + 4	6 + 2		
		7 + 1			

Name: _____

Year 1 - 30 seconds

BIG MATHS... ★
BEAT THAT! ★

My 'Beat That' score was...

~~17~~

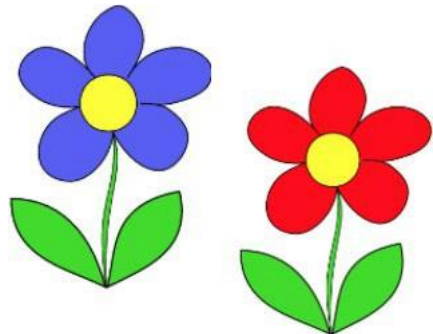
9 + 9 =	8 + 8 =	2 + 8 =
3 + 7 =	6 + 2 =	6 + 6 =
5 + 2 =	7 + 7 =	7 + 2 =
6 + 3 =	4 + 3 =	1 + 9 =
9 + 2 =	5 + 5 =	4 + 2 =
4 + 6 =		5 + 3 =

Y1
1

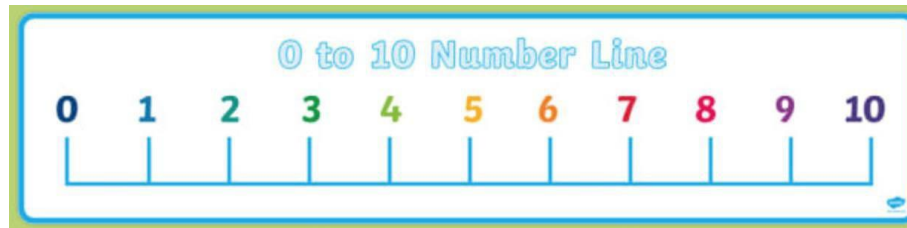
VARIATION

Variation is twofold. It is firstly about how the teacher represents the concept being taught, often in more than one way, to draw attention to critical aspects, and to develop deep and holistic understanding. It is also about the sequencing of the episodes, activities and exercises used within a lesson and follow up practice, paying attention to what is kept the same and what changes, to connect the mathematics and draw attention to mathematical relationships and structure (NCETM, 2019).

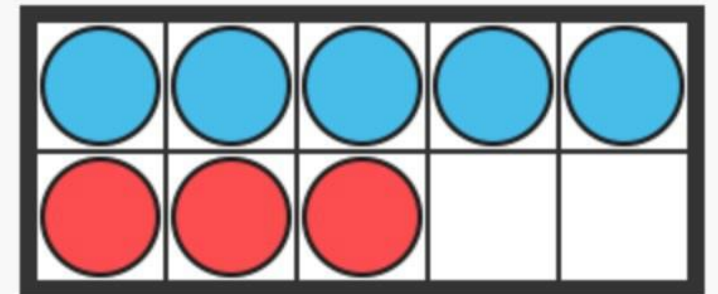
There are 3 red flowers and 5 blue flowers. How many flowers are there altogether?



There are 8 flowers; some are red and some are blue. If three of them are red, how many are blue?



There are 8 flowers; some are red and some are blue. If there are two more blue flowers than red flowers, how many are there of each colour?



30 < 20

more than

$$30 > 20$$

less than

$$12 < 15$$

30 < 15

nineteen sixteen

□ > □

62 ○ 52

3 tens
5 ones ○ 8 tens
9 ones

40 > □

□ ○ □

INCLUSIVITY – BUILDING SELF CONFIDENCE

In the past, children were put in different groups and given different content based on their anticipated ability. This meant that from an early age children were classed as those who can and can't "do maths".

Teaching maths for mastery at Holbrook Primary School is different because it offers all pupils access to the full maths curriculum. This inclusive approach, and its emphasis on promoting multiple methods of solving a problem, builds self-confidence and resilience in pupils. Misconceptions and errors will be identified during the whole class teaching. However, there might still be some small group teaching, but this is to provide interventions to those children who might need more time to grasp concepts.



DIFFERENTIATION – DEPTH RATHER THAN ACCELERATION

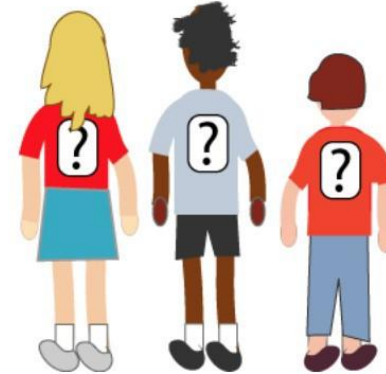
Though the whole class goes through the same content at the same pace, there is still plenty of opportunity for differentiation.

Unlike the old model, where advanced learners are accelerated through new content, those pupils who grasp concepts quickly are challenged with rich and sophisticated problems within the topic. Those children who are not sufficiently fluent are provided additional support to consolidate their understanding before moving on (Maths No Problem, 2019).

One Wasn't Square

Age 7 to 11 ★★

Mrs Morgan, the class's teacher, pinned numbers onto the backs of three children: Mona, Bob and Jamie.



"Now", she said, "Those three numbers add to a special kind of number. What is it?"

Michael put his hand up.

"It's a square number", he answered.

"Correct", smiled Mrs Morgan.

"Oh!" exclaimed Mona, "The two numbers I can see also add to a square!"

"And me!" called out Bob, "The two numbers I can see add to a square too!"

"Oh dear", said Jamie disappointedly, "the two numbers I can see don't add to a square! It's either 5 too little or 6 too big!"

What numbers did the three children have on their backs?

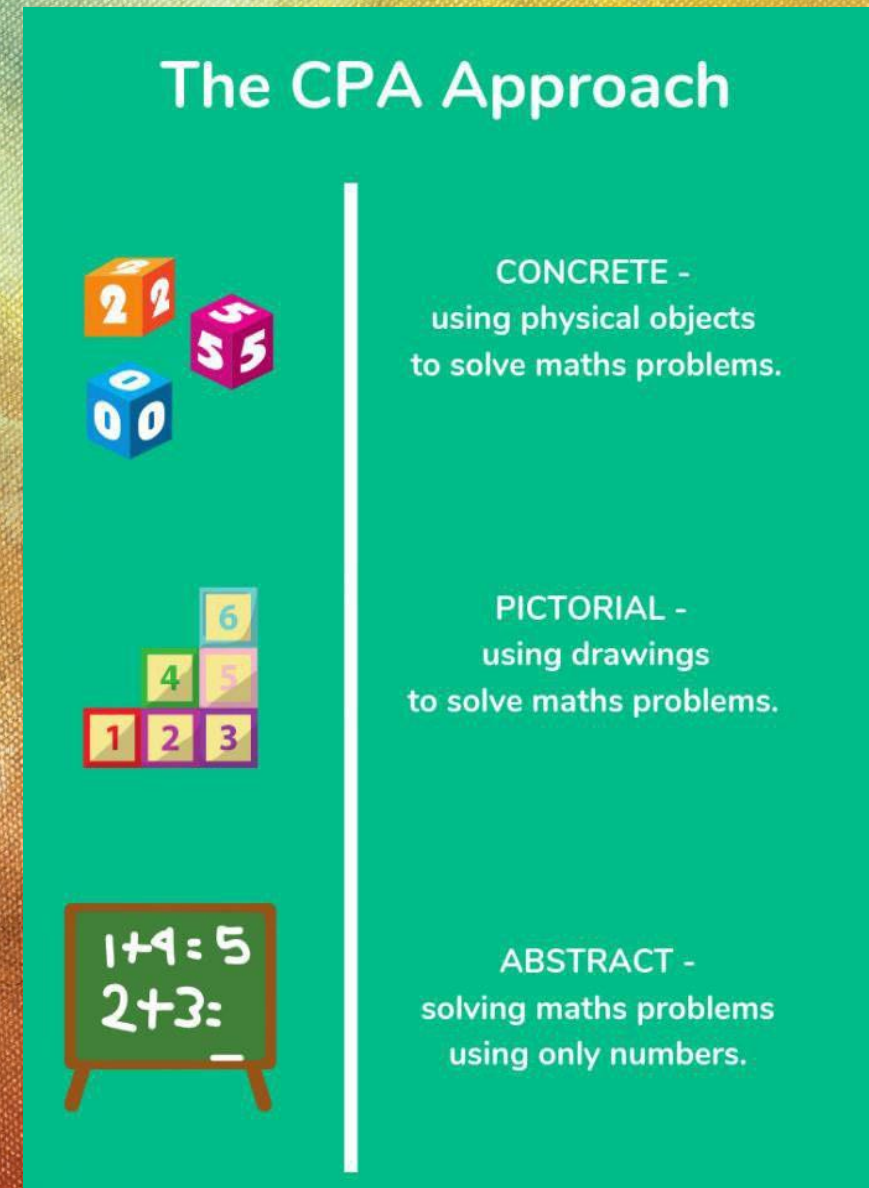


CONCRETE – PICTORIAL – ABSTRACT APPROACH

Concrete, Pictorial, Abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths in pupils.

CPA was developed by American psychologist, Jerome Bruner. It is an essential technique within maths mastery teaching.

This approach is used from Reception through to Year 6.



CPA – CONCRETE STEP

Concrete is the ‘doing stage’. During this stage, children use concrete objects to model problems.

Unlike traditional maths teaching methods where teachers demonstrate how to solve a problem, the CPA approach brings concepts to life by allowing children to experience and handle physical (concrete) objects.

With the CPA framework, every abstract concept is first introduced using physical, interactive concrete materials (Maths No Problem, 2019).

For example, if a problem involves adding paintbrushes, children can first handle paintbrushes. From there, they can progress to handling abstract counters or cubes which represent the paintbrushes.

SOME OF THE
CONCRETE RESOURCES
THAT WE USE IN
SCHOOL

MULTILINK CUBES



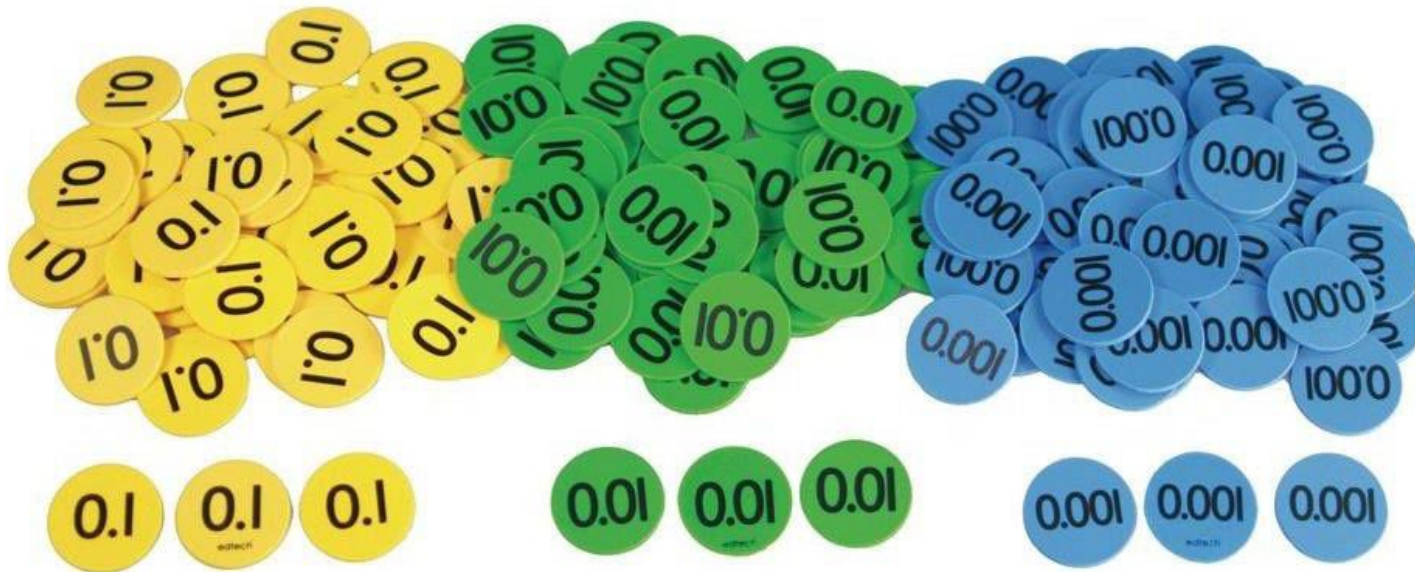
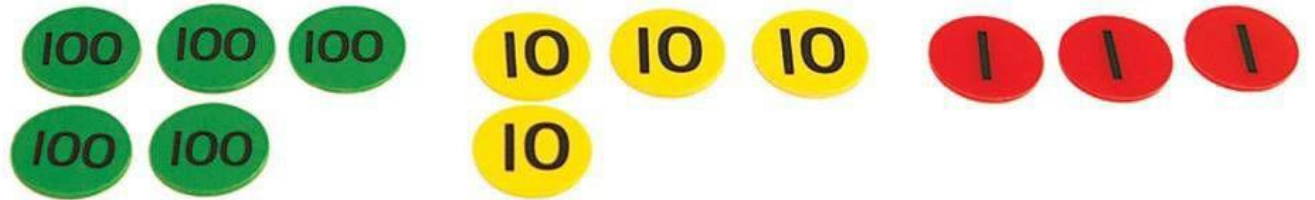
SOME OF THE
CONCRETE RESOURCES
THAT WE USE IN
SCHOOL

NUMICON



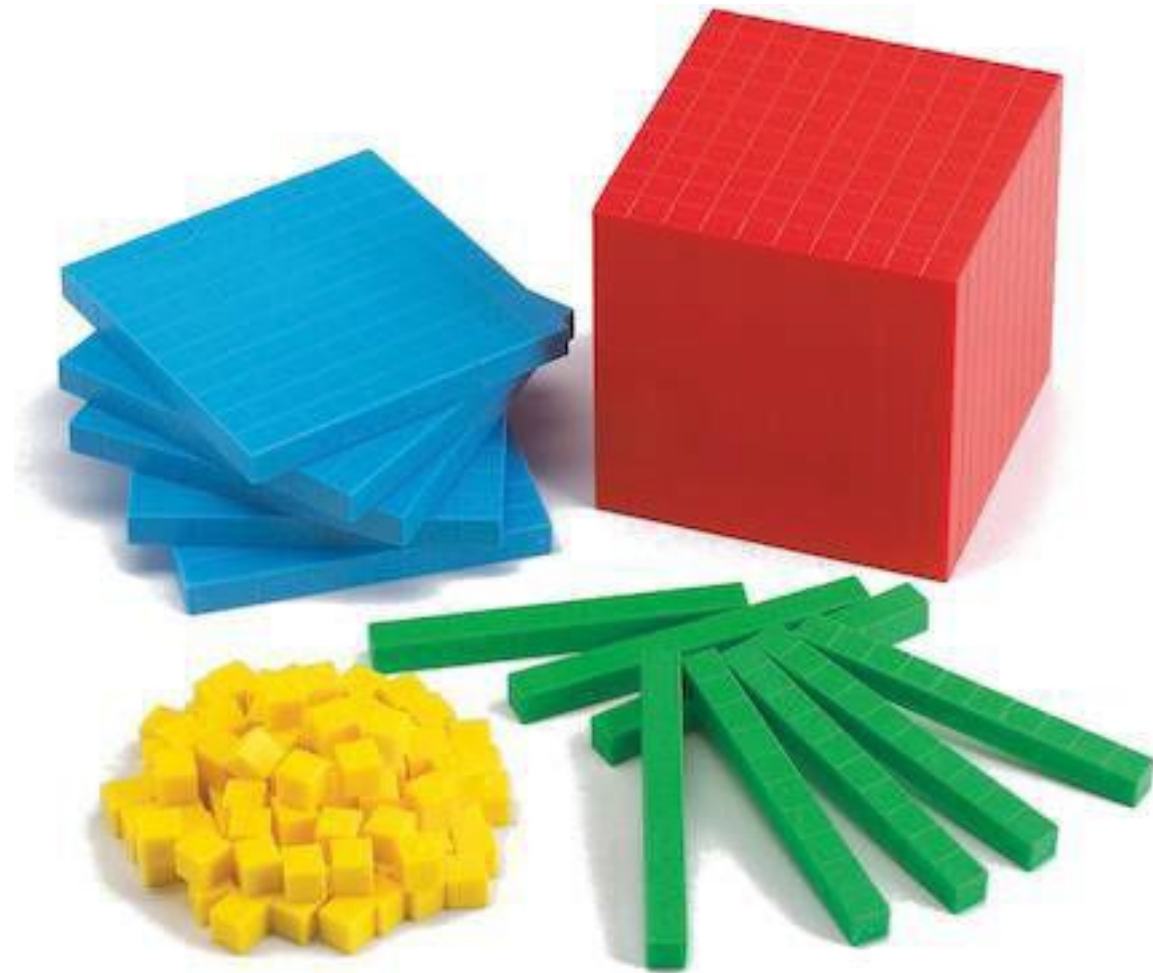
SOME OF THE
CONCRETE RESOURCES
THAT WE USE IN
SCHOOL

PLACE VALUE COUNTERS



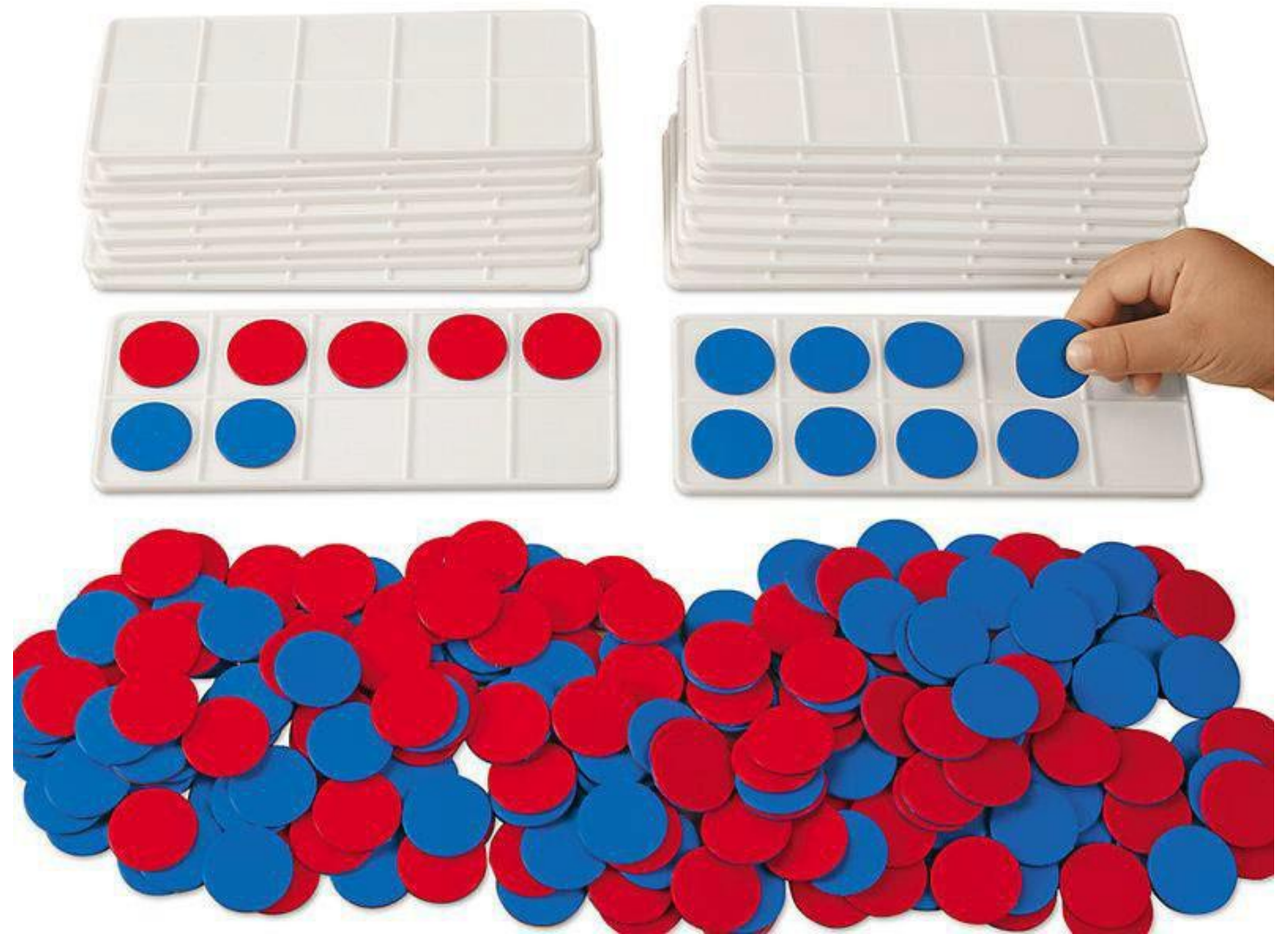
SOME OF THE
CONCRETE RESOURCES
THAT WE USE IN
SCHOOL

BASE 10 EQUIPMENT



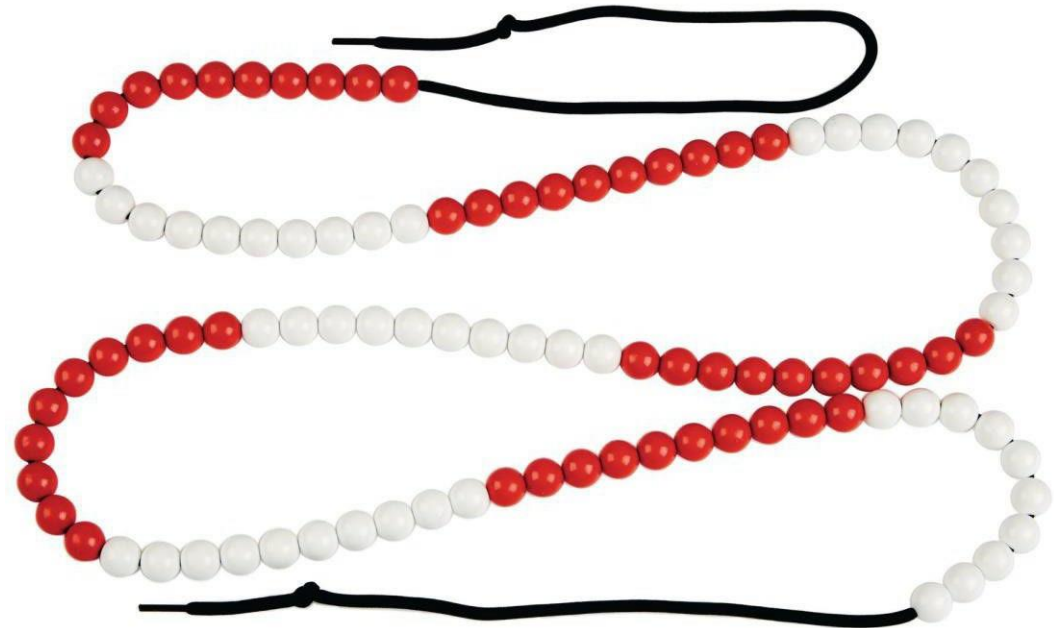
SOME OF THE
CONCRETE RESOURCES
THAT WE USE IN
SCHOOL

TENS FRAMES AND
DOUBLE SIDED COUNTERS



SOME OF THE
CONCRETE RESOURCES
THAT WE USE IN
SCHOOL

BEAD STRINGS





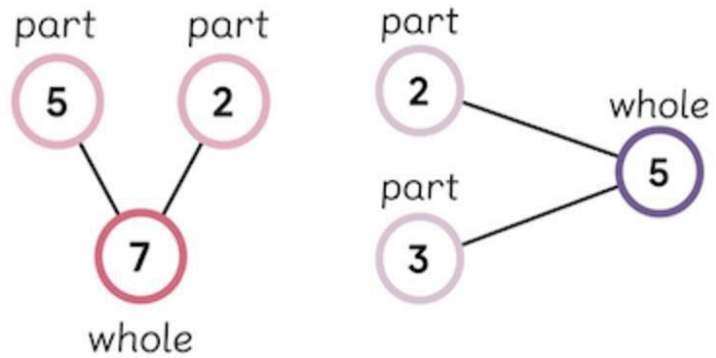
BUT REALLY THERE IS NO END TO THE
CONCRETE RESOURCES WE/YOU CAN YOU USE

CPA – PICTORIAL STEP

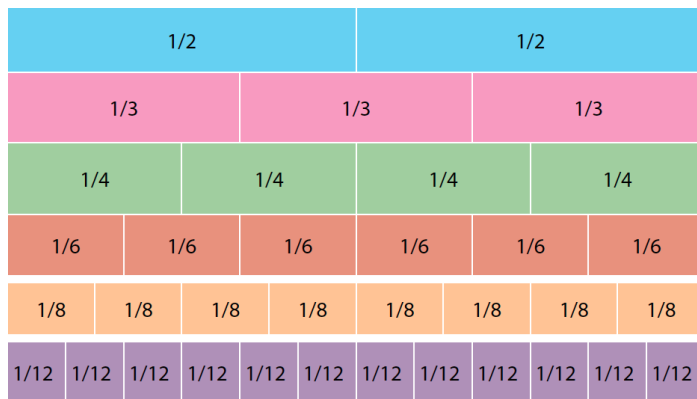
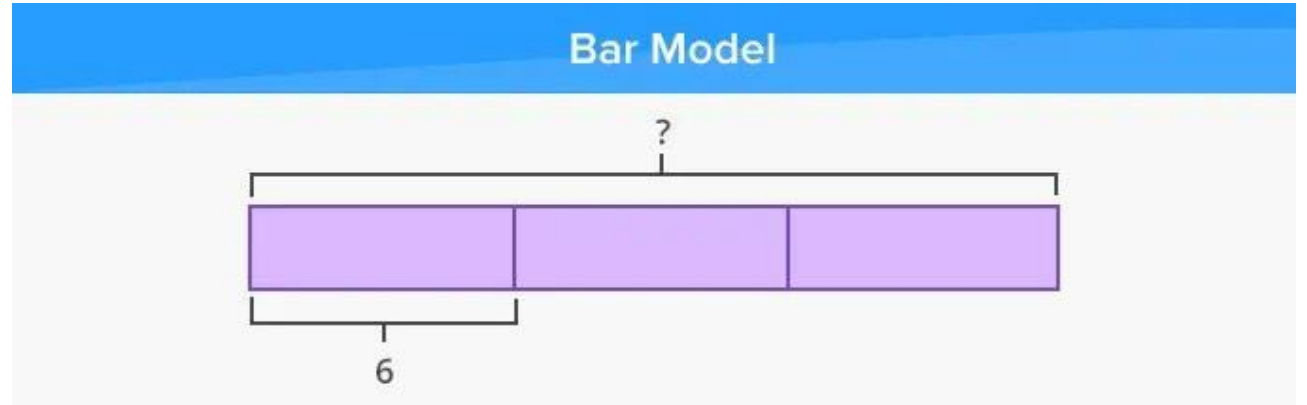
Pictorial is the ‘seeing’ stage. Here, visual representations of concrete objects are used to model problems. This stage encourages children to make a mental connection between the physical object they just handled and the abstract pictures, diagrams or models that represent the objects from the problem.

Building or drawing a model makes it easier for children to grasp difficult abstract concepts (e.g. fractions). Simply put, it helps the children visualise abstract problems and makes them more accessible (Maths No Problem, 2019).

EXAMPLES OF MODELS AND DIAGRAMS

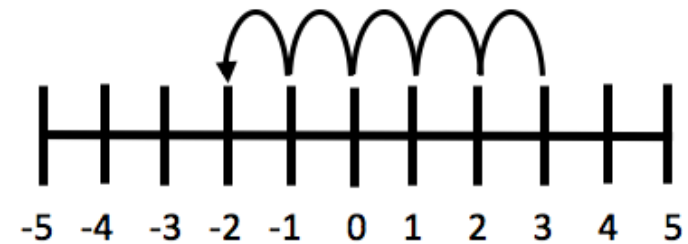


Part-whole model



Fraction wall

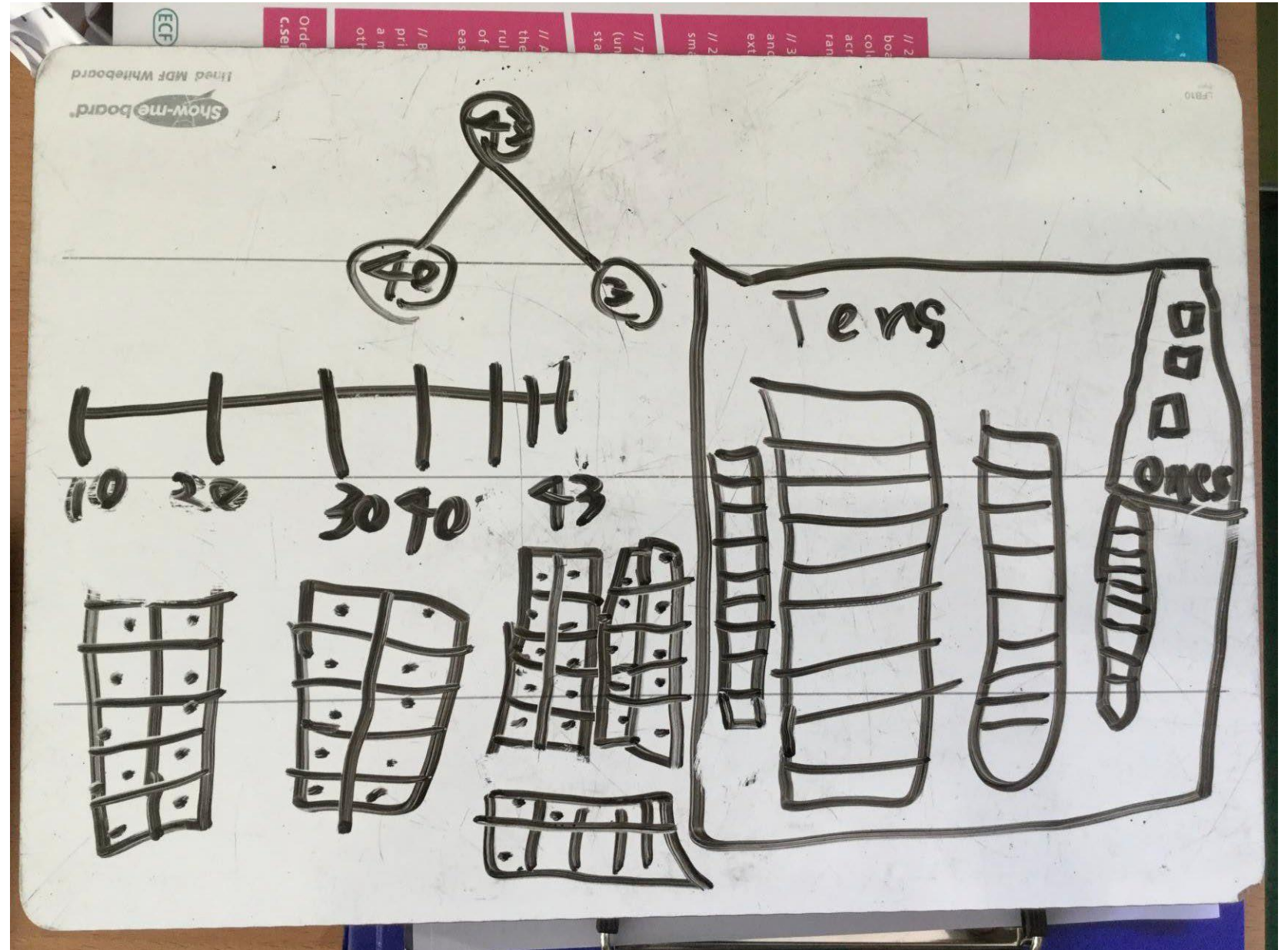
Question: What is $3 - 5$?

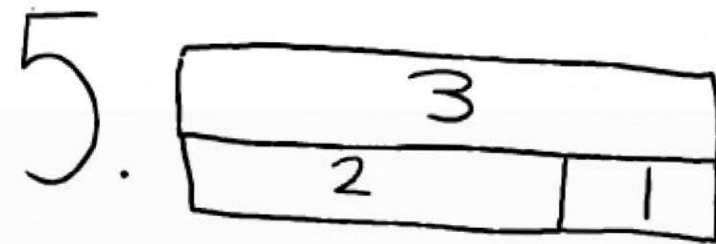
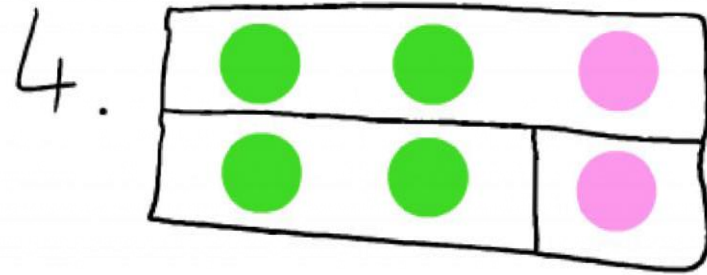
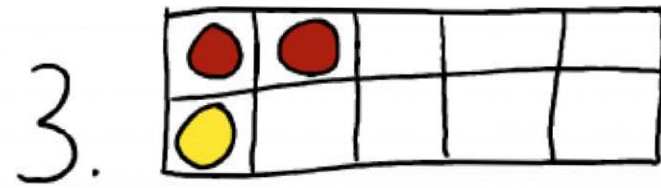
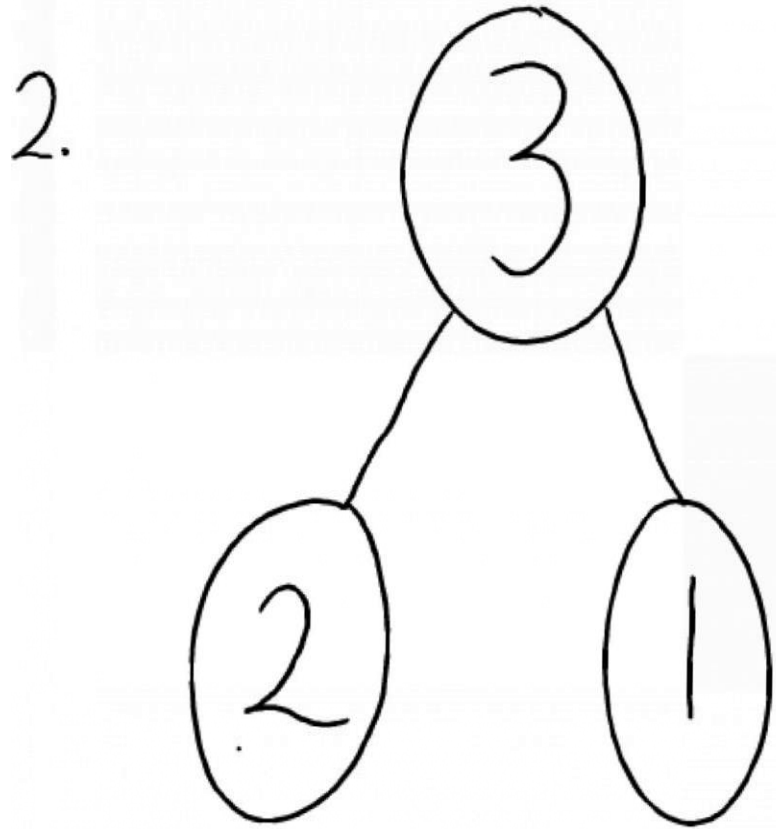
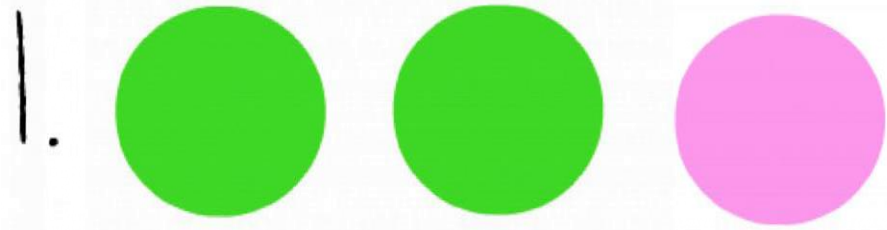


Answer = -2

Number line

WHEN EXPLORING PLACE VALUE OF 2-DIGIT NUMBERS, A CHILD IN YEAR 1 SUCCESSFULLY DREW:
A PART-WHOLE MODEL, A NUMBER LINE, TENS FRAME, BASE 10 EQUIPMENT TO SHOW THE NUMBER 43





6. $2 + 1 = 3$ $3 - 2 = 1$
 $1 + 2 = 3$
 $3 = 2 + 1$ $3 - 1 = 2$
 $3 = 1 + 2$

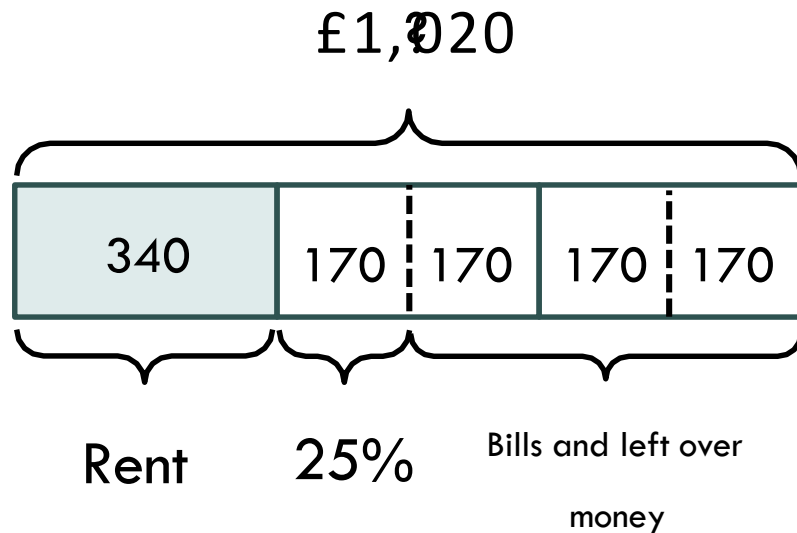
4

Every month John spends $\frac{1}{3}$ of his money on rent.

Of the remaining money he spends 25% on going out.

He spends £460 on bills and has £50 left over.

How much money does John earn every month?

ModelCalculations

$$460 + 50 = 510$$

$$510 \div 3 = 170$$

$$170 \times 2 = 340$$

$$340 \times 3 = 1,020$$

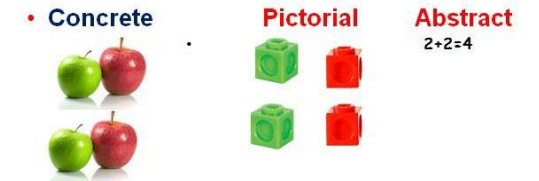
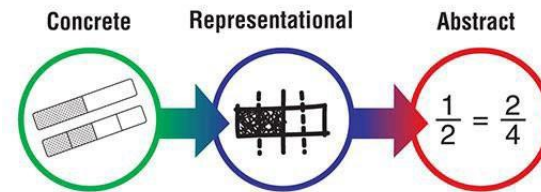
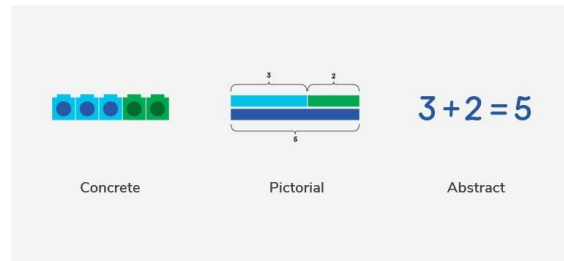
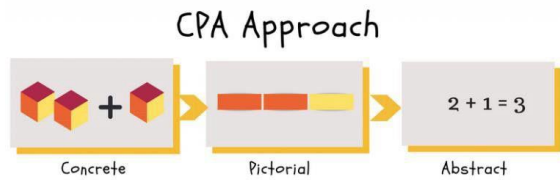
John earns £1,020 each month.

CPA – ABSTRACT STEP

Abstract is the ‘symbolic’ stage, where children use abstract symbols to model problems. They will not progress to this stage until they have demonstrated that they have a solid understanding of the concrete and pictorial stages of the problem.

The abstract stage involves the teacher introducing abstract concepts (e.g. mathematical symbols). Children are introduced to the concept at a symbolic level, using only numbers, notation, and mathematical symbols

(e.g. $+$, $-$, \times , $/$) to indicate addition, subtraction, multiplication or division.



ALTHOUGH WE'VE OUTLINED CPA AS THREE DISTINCT STAGES, THE TEACHERS WILL GO BACK AND FORTH BETWEEN EACH STAGE TO REINFORCE CONCEPTS.

The background features a dark blue gradient with faint, light-colored mathematical diagrams. On the left, a large protractor scale is visible, with markings from 40 to 260 degrees. Various geometric shapes, including circles, arcs, and dashed lines, are scattered across the upper portion of the image. The text 'White Rose Mathematics' is centered in a white, sans-serif font and is underlined with a thick white horizontal line.

White Rose Mathematics

- Maths mastery is an approach to teaching maths.
- White Rose Mathematics is a scheme of work or learning (SOW/ SOL) for teaching maths.
- There are a wide variety of SOW/ SOLs available to schools currently on the market. As a staffing team, we consulted and compared different SOLs.

White Rose Mathematics was the one best fitted for us to adopt. We also use other resources that are linked to White Rose scheme.



White Rose Maths is an organisation that provides maths resources and Schemes of Learning for pupils of all ages, from early years to secondary school. The Schemes of Learning (SOL) outline yearly frameworks that break down what children need to learn during each week of each term to master the learning objectives laid out by the National Curriculum. And resources that are aligned with the White Rose Maths frameworks are designed to be enjoyable, engaging and varied, to help pupils develop a love of learning and work towards mastery with differentiated resources.

But what defines White Rose Maths more than their resources and frameworks is their approach to teaching maths. At the heart of their resources and frameworks is the motto “Everyone Can Do Maths: Everyone Can!” — a slogan that we wholeheartedly agree with at Holbrook C of E Primary

White Rose Maths



White Rose Mathematics

- Builds every concept in small, progressive steps.
- Is built with interactive, whole-class teaching in mind.
- Provides the tools you need to develop growth mindsets.
- Helps us check understanding and ensure that every child is keeping up.
- Establishes core elements such as intelligent practice and reflection.

Meet the characters

Our class of characters bring the schemes to life, and will be sure to engage learners of all ages and abilities. Follow the children and their class pet, Tiny the tortoise, as they explore new mathematical concepts and ideas.



Yearly overview

The yearly overview provides suggested timings for each block of learning, which can be adapted to suit different term dates or other requirements.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value				Number Addition and subtraction			Measurement Area	Number Multiplication and division A			Consolidation
Spring	Number Multiplication and division B			Measurement Length and perimeter		Number Fractions				Number Decimals A		
Summer	Number Decimals B		Measurement Money		Measurement Time		Consolidation	Geometry Shape		Statistics	Geometry Position and direction	

Step 1

Fluency

Factor pairs

Key learning

- Complete the factor pairs of 12 and the sentences.


 $1 \times \underline{\quad} = 12$


 $\underline{\quad} \times 6 = 12$


 $\underline{\quad} \times \underline{\quad} = 12$

12 has $\underline{\quad}$ factor pairs.

12 has $\underline{\quad}$ factors altogether.

- Use counters to create arrays and find the factor pairs for each number.

18

24

30

- Which of these numbers are factors of 20?

2 3 5 8 10 15

Use cubes or counters to show how you know.

- Here is a factor bug for 12



Complete the factor bug for 20



- Draw a factor bug for each number.

48

35

16

56

Which of the numbers has an odd number of factors?

Can you find another number with an odd number of factors?


- Find all the factor pairs of 60

Step 2

Problem Solving and Reasoning


Factor pairs

Reasoning and problem solving



The greater the number, the more factors it has.

Is Tommy correct?
Use arrays to explain your answer.




No
multiple possible answers, e.g. 15 has 4 factors and 17 has 2 factors

Is the statement always true, sometimes true or never true?

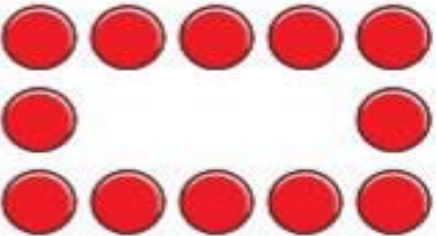
An odd number has an odd number of factors.

Explain your answer to a partner.




sometimes true


Alex has made an array using 12 counters.



5 and 3 are a factor pair of 12



Do you agree with Alex?
Explain your answer.



No

2. Spot the errors and correctly calculate.

$$\frac{5}{6} + \frac{7}{8} = \frac{30}{26} + \frac{28}{36} = \frac{58}{36} = 1 \frac{22}{36} = 1 \frac{11}{18}$$

$$\frac{7}{10} + \frac{5}{12} = \frac{45}{60} + \frac{24}{60} = \frac{69}{60} = 1 \frac{9}{60} = 1 \frac{1}{10}$$

$$1 \frac{3}{8} + 2 \frac{2}{3} = 1 \frac{9}{24} + 2 \frac{16}{24} = \frac{25}{24}$$

3. $\frac{7}{8} + \frac{5}{6} + \frac{1}{3} = \frac{21}{24} + \frac{20}{24} + \frac{8}{24} = \frac{49}{24} = 2 \frac{1}{24}$

They ordered three pizzas and $\frac{23}{24}$ was left.

4. $\frac{1}{2} + \frac{1}{4}, \frac{3}{8} + \frac{3}{8}, \frac{5}{8} + \frac{1}{8}, \frac{1}{8} + \frac{1}{12} \dots$

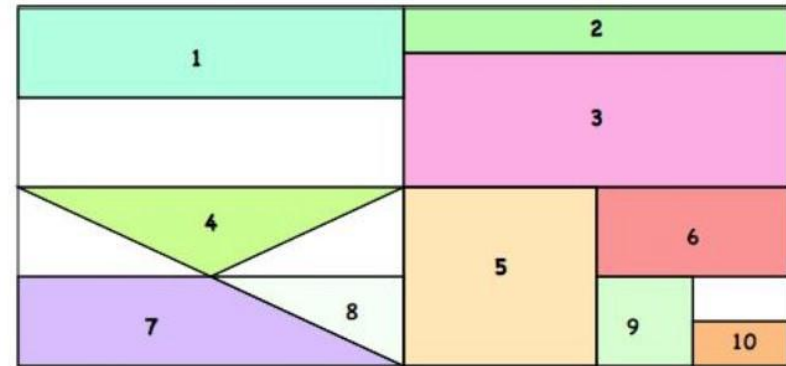
5. $\frac{9}{10} < 1$, so $\frac{9}{10} - \frac{1}{4} < 1$ but $\frac{8}{6} > 1$

$$\frac{9}{10} - \frac{1}{4} = 0.9 - 0.25 = 0.65 \text{ but } \frac{8}{6} = 1.33$$

$$\frac{9}{10} - \frac{1}{4} = \frac{18}{20} - \frac{5}{20} = \frac{13}{20}$$

Rectangle Tangle

Age 7 to 11 ★



The large rectangle above is divided into a series of smaller quadrilaterals and triangles. Each of the shapes is a fractional part of the large rectangle.

Can you untangle what fractional part is represented by each of the ten numbered shapes?

The background features a dark blue gradient with a field of small white stars. Overlaid on this are several technical diagrams: a large circular scale on the right with numerical markings from 80 to 210 and arrows indicating direction; a smaller circular diagram below it with dashed lines and arrows; and a partial circular diagram in the bottom left corner. The text 'THANK YOU' and 'QUESTIONS' is centered in white, sans-serif font.

THANK YOU

QUESTIONS