Parents and Carers

Maths Professional Development Meeting

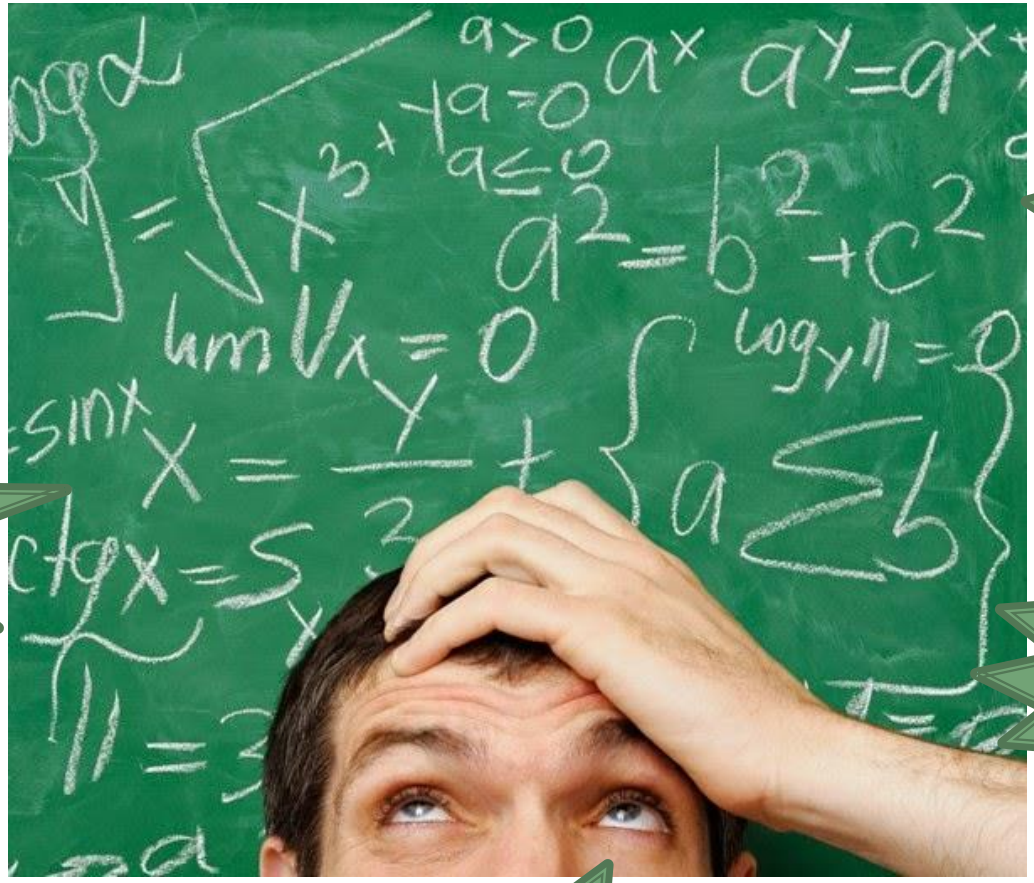
Summer 2023

THE CAREY FEDERATION

Your memories of mathematics…

Tests

Rules



Right or wrong

Speed

Memory

Drill and Practice

Confusion

Over-reliance on formal methods
A sledgehammer to crack a nut

$$\begin{array}{r} {\scriptstyle 0}\,{\scriptstyle 1}\,{\scriptstyle 9}\,{\scriptstyle 1}\,{\scriptstyle 9}\,{\scriptstyle 1} \\ 1\,0\,0\,0 \\ -\quad\;\; 7 \\ \hline 9\,9\,3 \end{array}$$

$$\begin{array}{r} {\scriptstyle 0}\,{\scriptstyle 1} \\ 1\,6 \\ -\;\; 9 \\ \hline 7 \end{array}$$

$$\begin{array}{r} 97 \\ \times\; 100 \\ \hline 00 \\ 000 \\ 9700 \\ \hline 9700 \end{array}$$

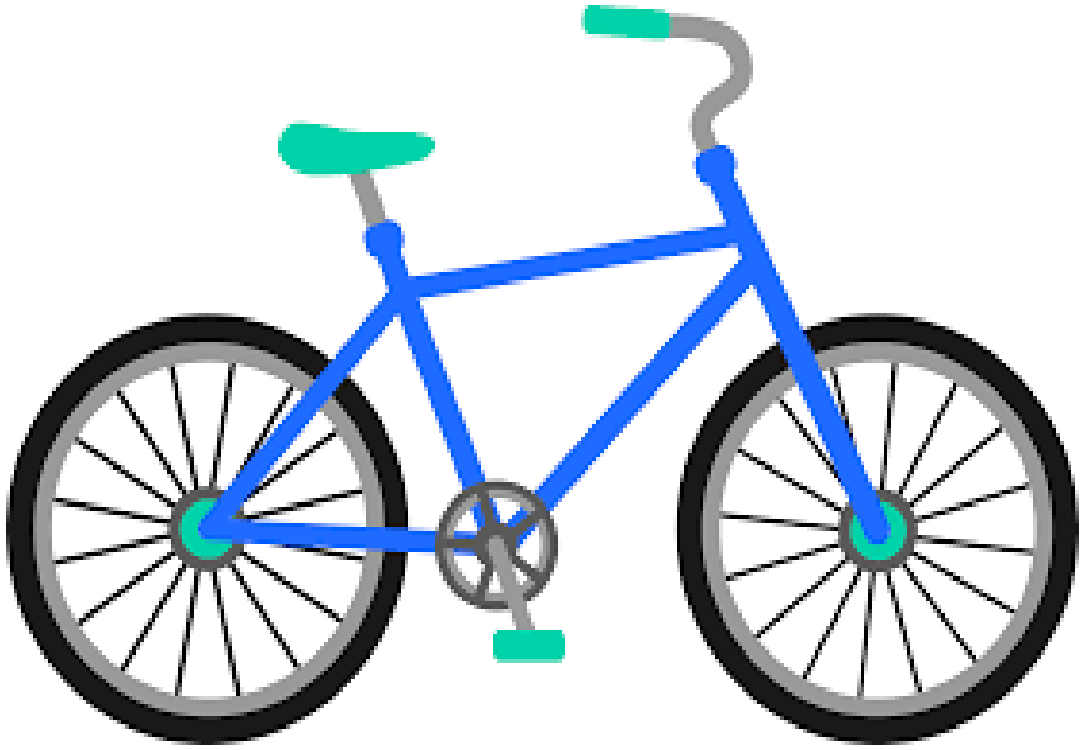
$$\begin{array}{r} 0\,8 \\ 7\overline{)\,5\,6} \end{array}$$

Why did it change significantly in Maths?

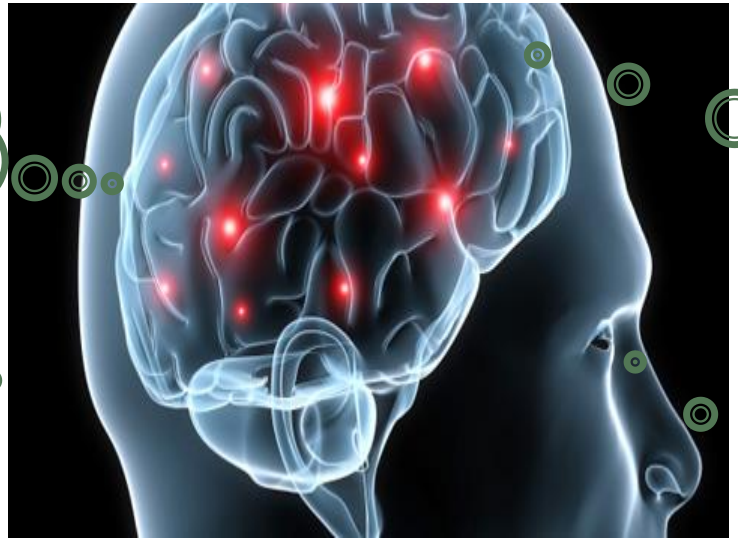
'Mastery' in general terms:

- I know how to do it
- It becomes automatic and I don't need to think about it
- I'm really good at doing it
- I can show someone else how to do it

So what do we mean by Mastery?



Analogy – Learning to ride a bike



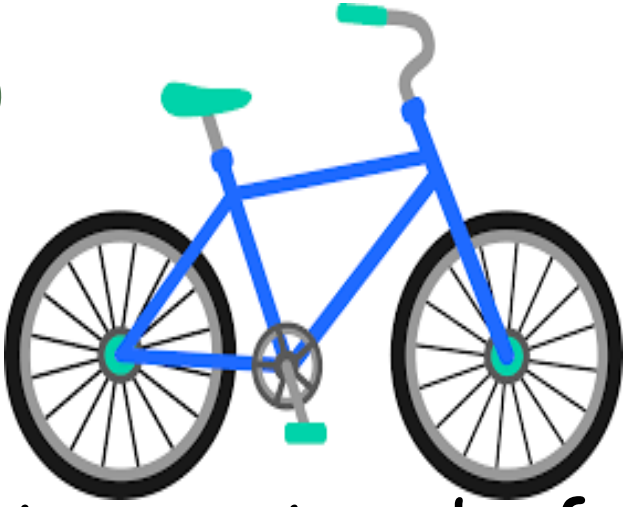
Pedalling

Steering with the handlebars

Watching the road

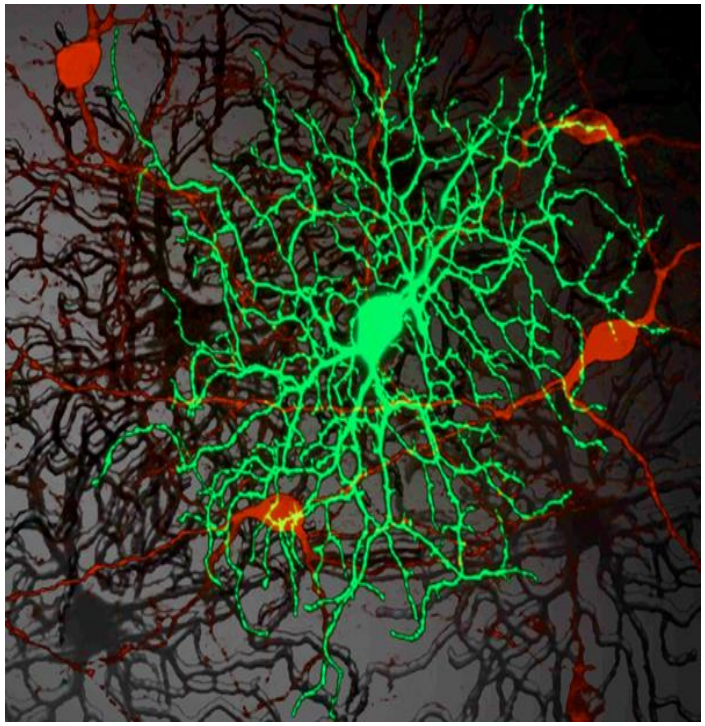
Staying Balanced

Breaking

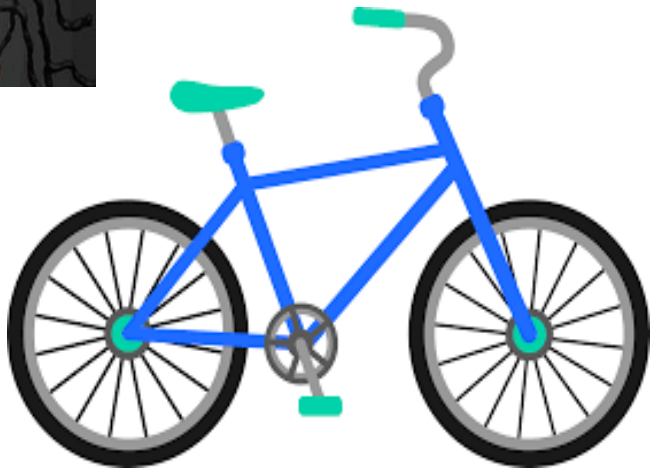


Lots of skills to *master* before riding a bike successfully

The Brain builds pathways between the neurons as synapses fire between them when we learn, making those connections stronger.



A 'Riding Bike' Pathway



'I can ride a bike' - once mastered, never forgotten.

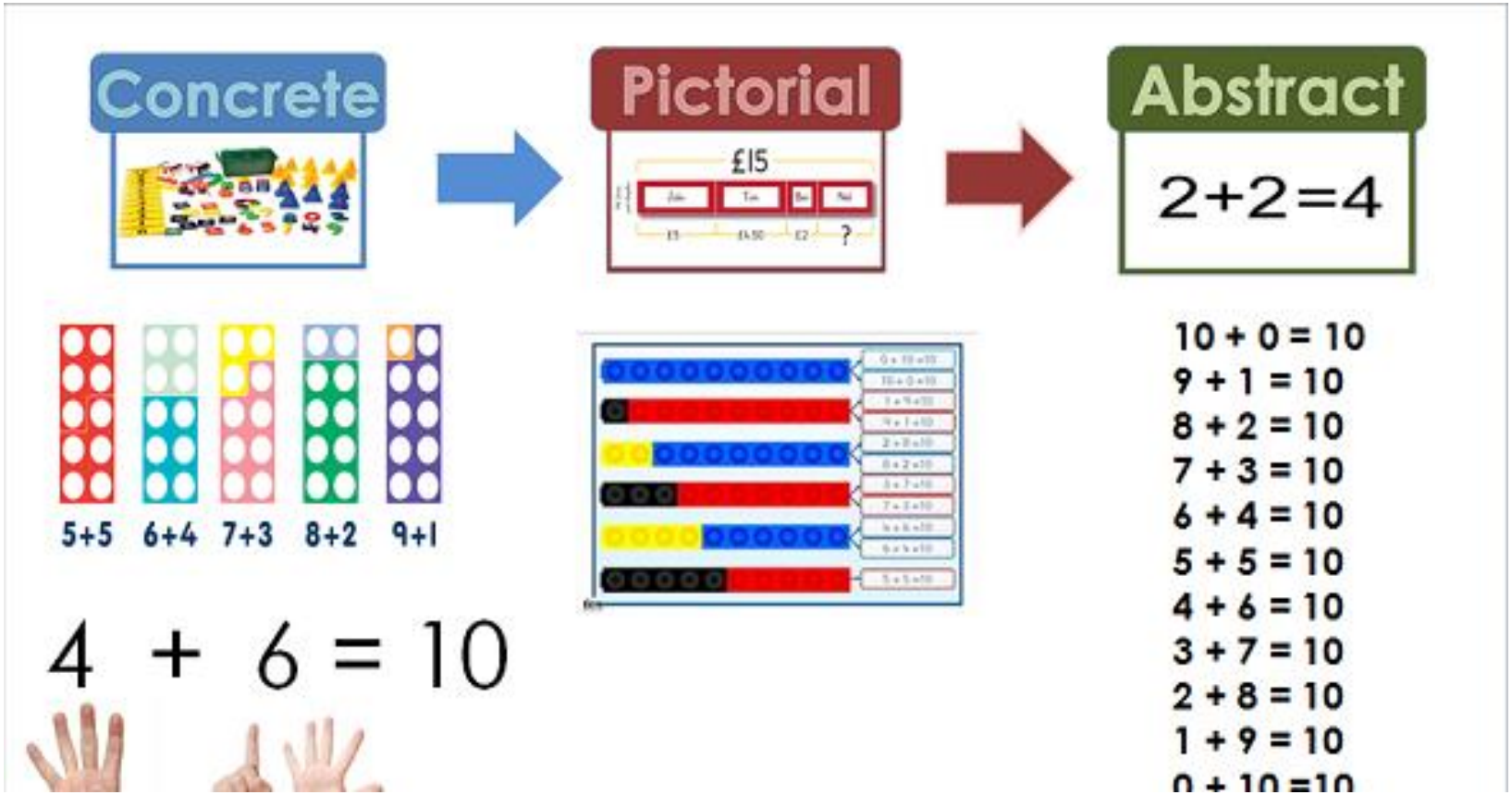
What could it look like for pupils in a classroom?

Beyond Mastery (Greater Depth) – Once proficient you can apply these 'mastered' skills to different situations and develop deeper understanding.

Not acceleration into new content

Nor children working on different content and skills

Teachers adapt their teaching to meet the needs of all learners.



CPA – Adaptive approach to teaching mathematics

Teaching for deep understanding, not just memory…

Division of Fractions

Turn a Fraction upside down and multiply

Why does this work?

Instrumental understanding versus
Relational understanding

Turn a Fraction upside down and multiply

Why does this work?

2 ÷ 1/3 (Instrumental)

Keep, Flip, Change

$$2 \times \frac{3}{1} = 6$$

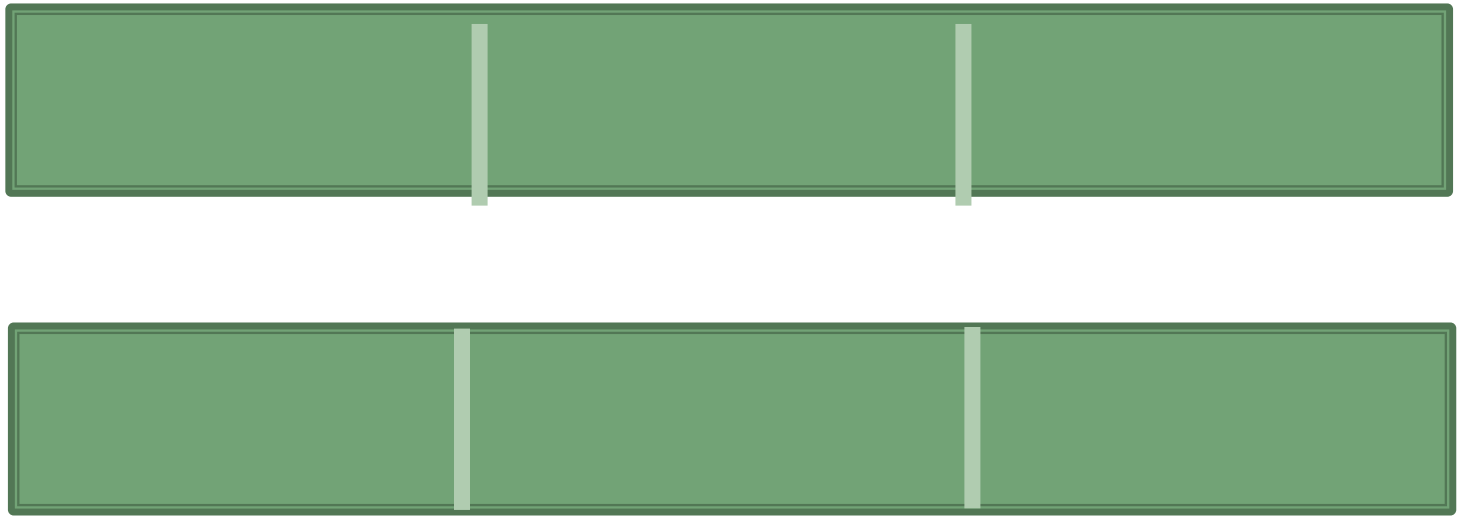
Who can tell me what the 6 represents?

$2 \div 1/3$

How many 3^{rd} 's are in 2?

2 ÷ 1/3

How many 3rd 's are in 2? 6(thirds)

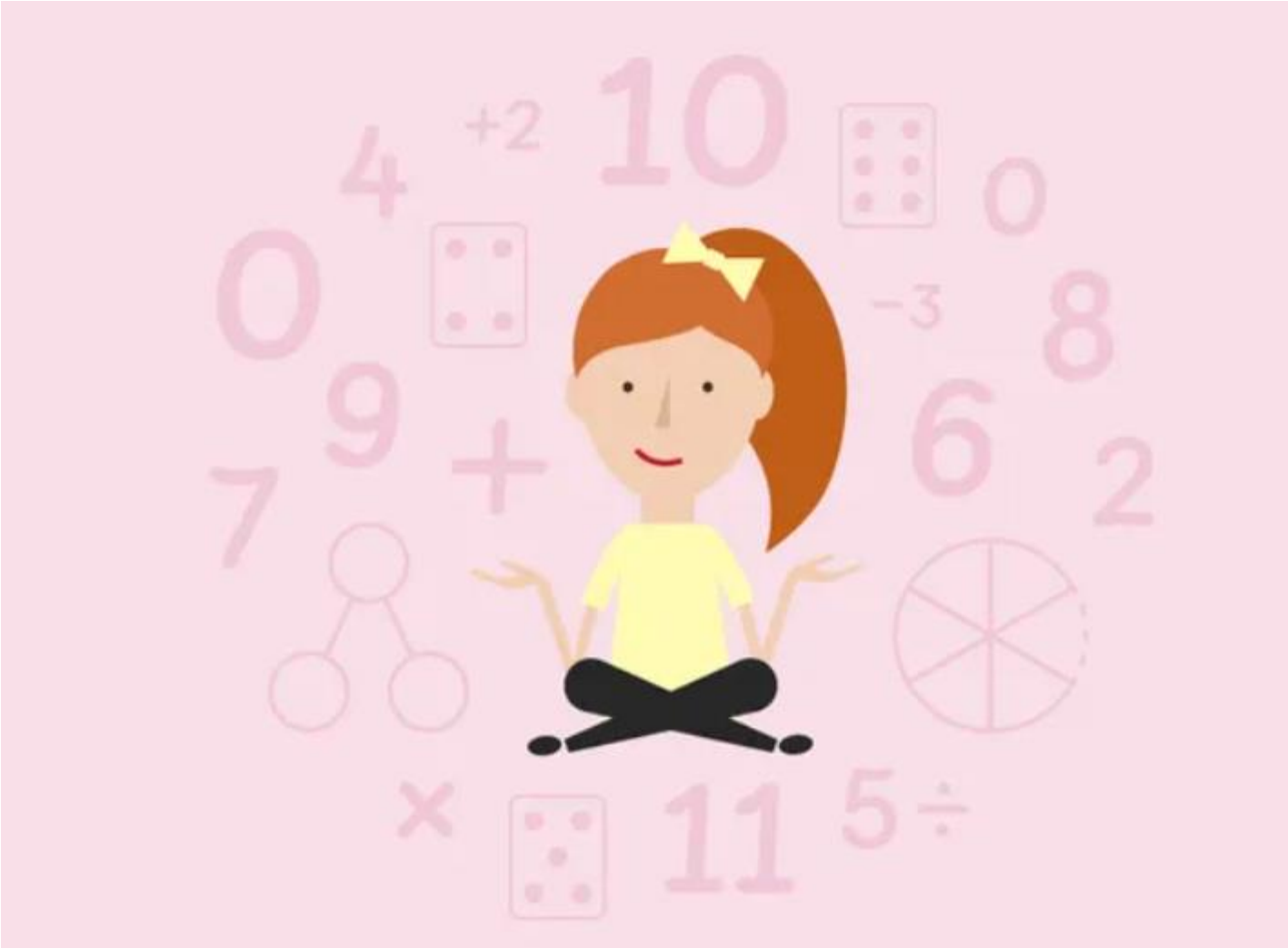


The answer 6 represents the number of thirds there are in 2 wholes – this is ***relational*** understanding

So, *what is effective in the learning and teaching of mathematics?*

Answer: *A 'Teaching for Mastery' approach that uses concrete objects, pictorial images that relate to abstract numbers so that children can understand mathematical concepts more deeply.*

How important is number sense?



(Turns out, very)

How many?

So, what is number sense and why is it important for learners to develop this skill?

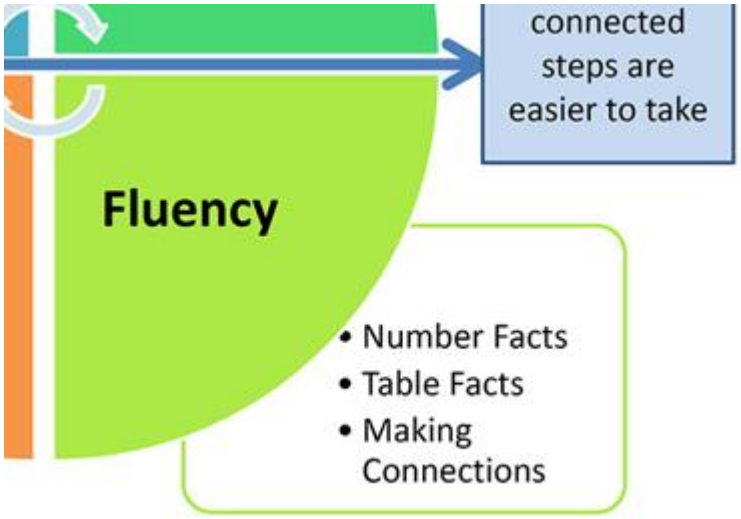
The construct of number sense refers to a ***child's fluidity and flexibility with numbers***. It helps children understand what numbers mean, improving their performance of mental mathematics, and giving them the tools to look at maths in the outside world and make comparisons.

For example…

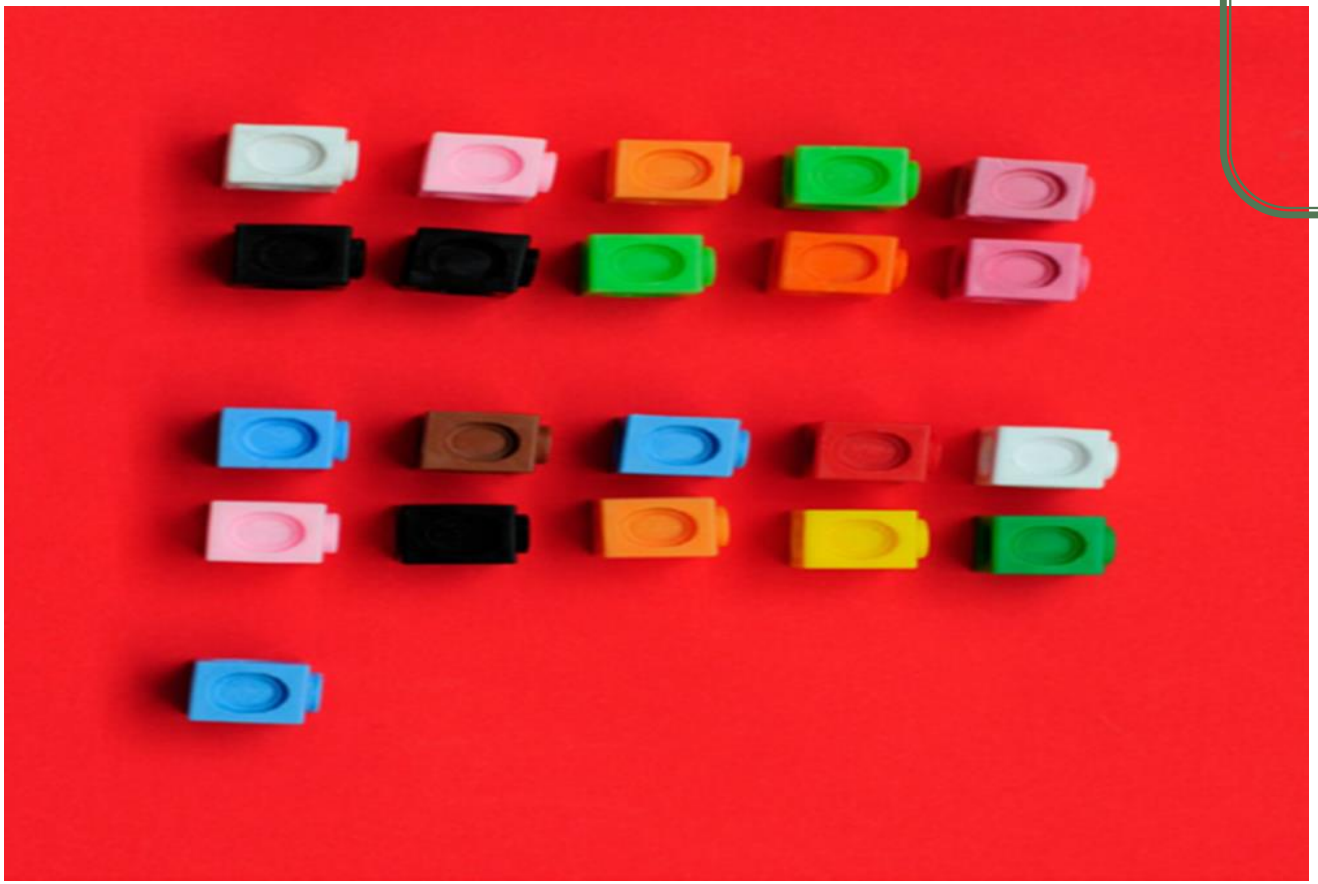
16

9 –

One of the 5 Big Ideas of ***Teaching for Mastery***



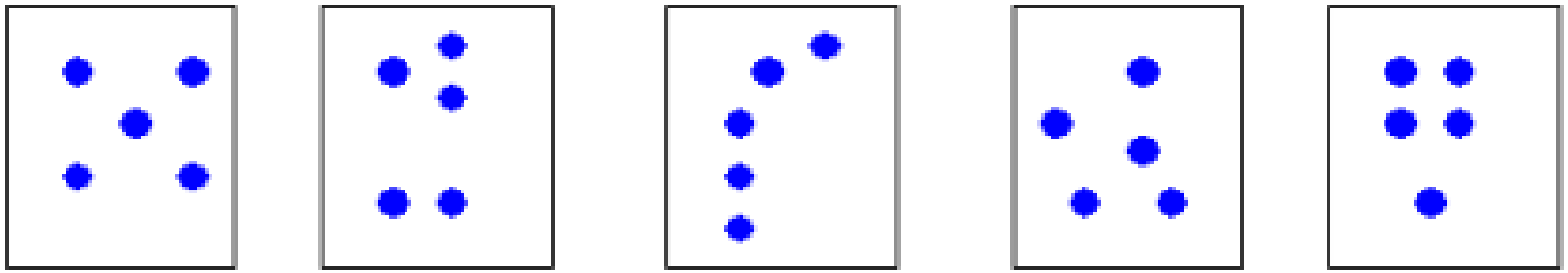
Estimate how many now?



Did you need to count?

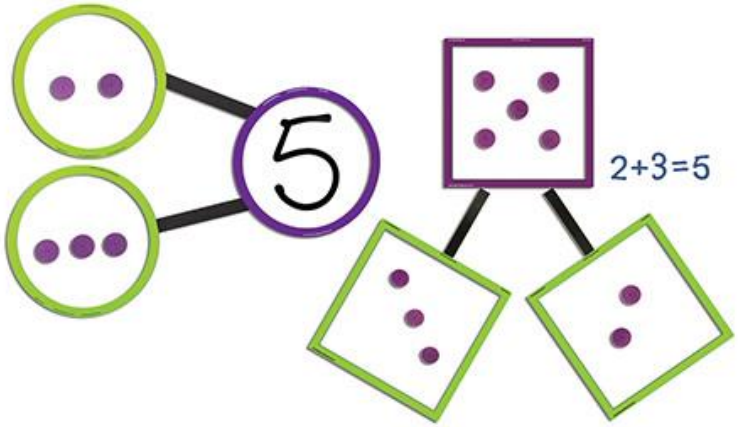
Many of you will have subitised…

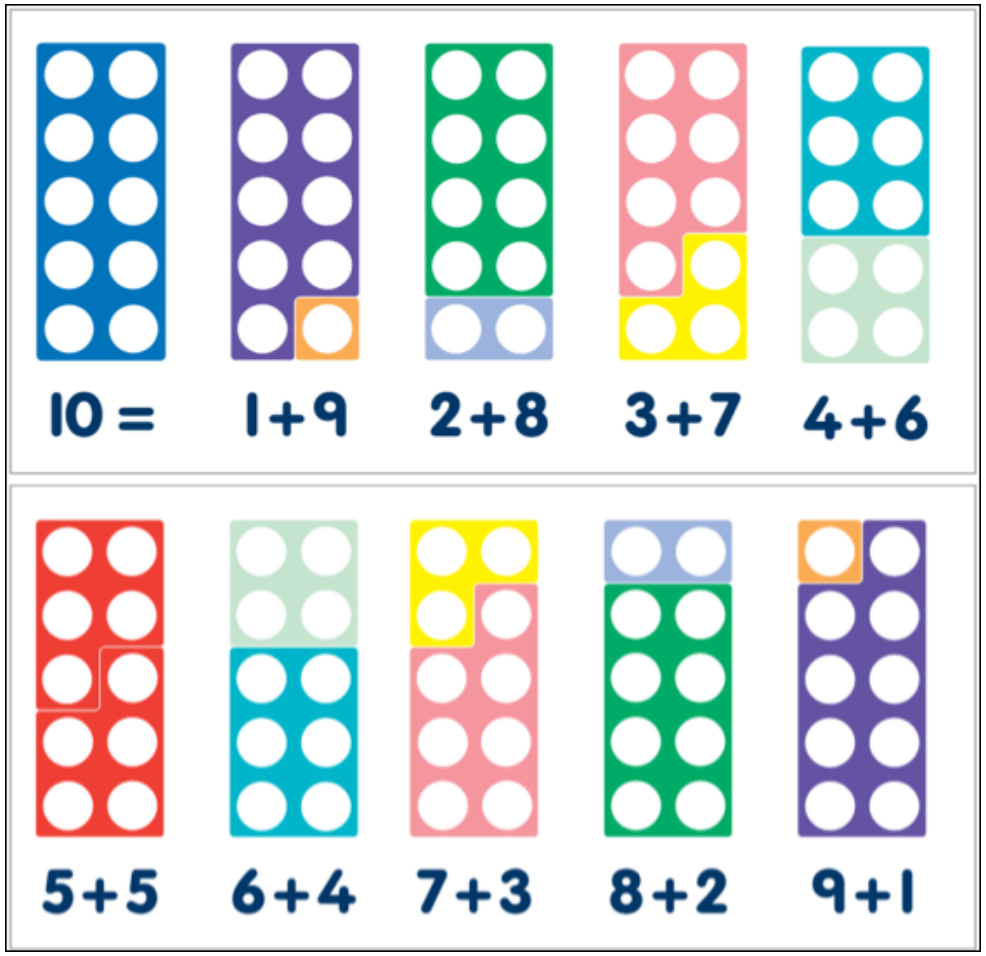
❑ Subitising



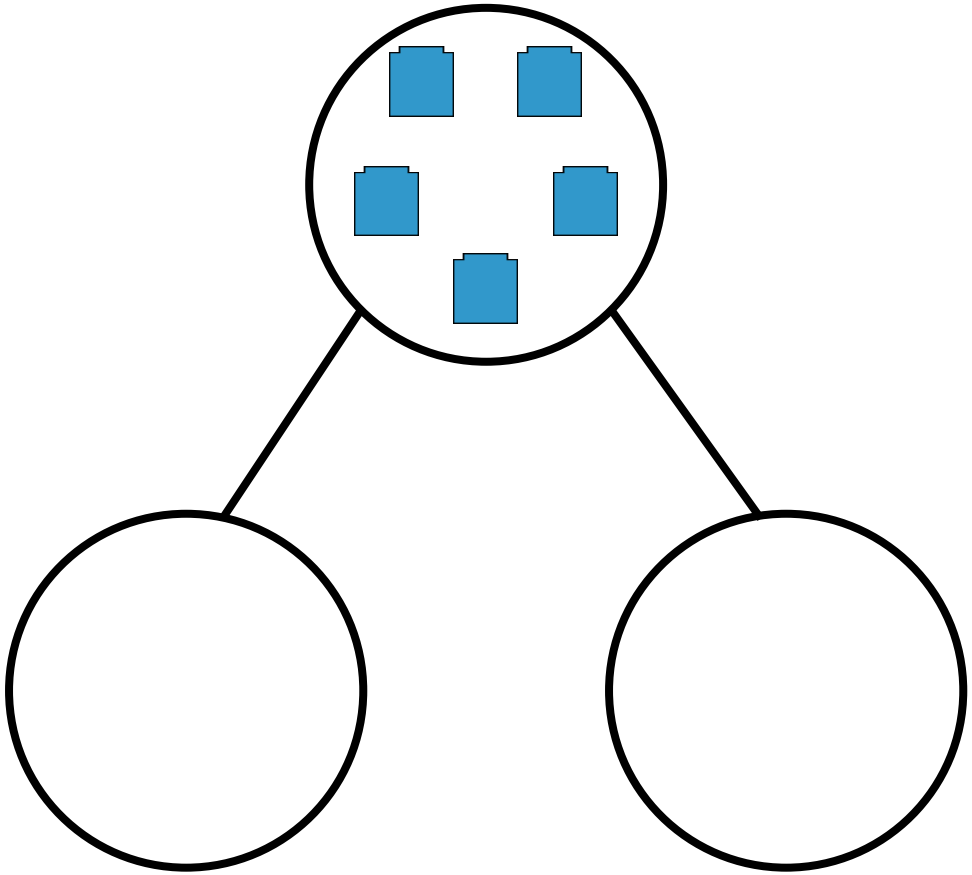
Subitising - 'seeing' numbers
Moving towards structures

Importance of knowing Number Bonds

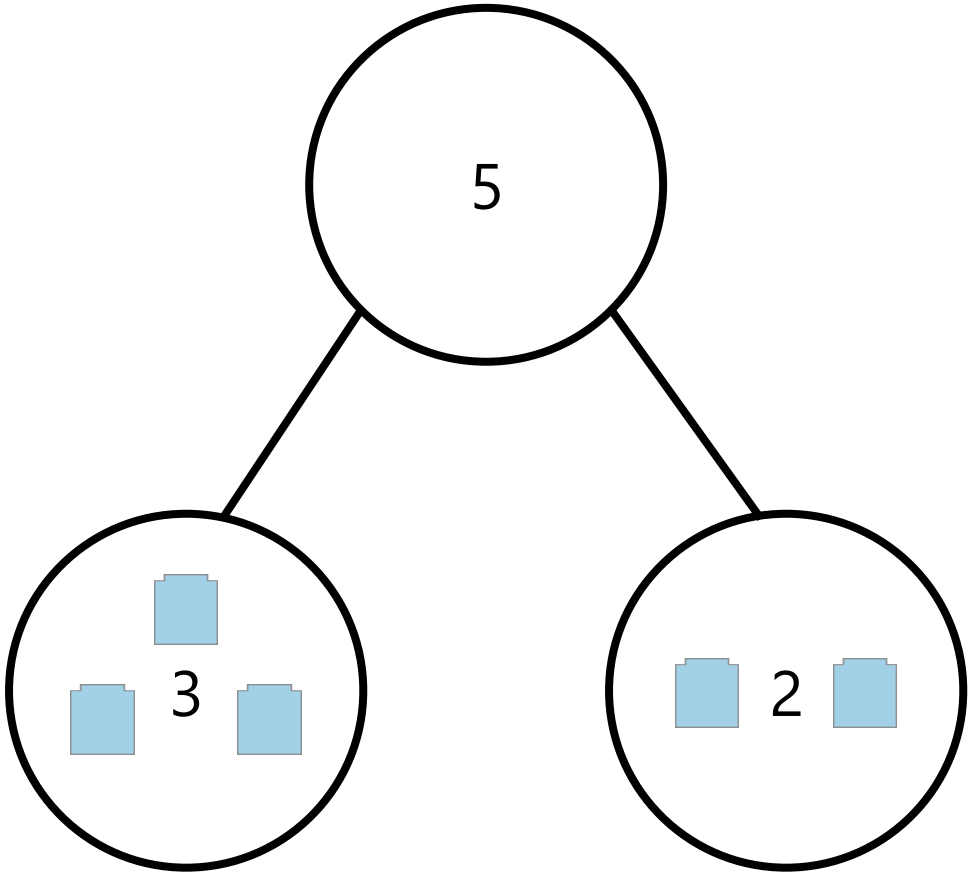




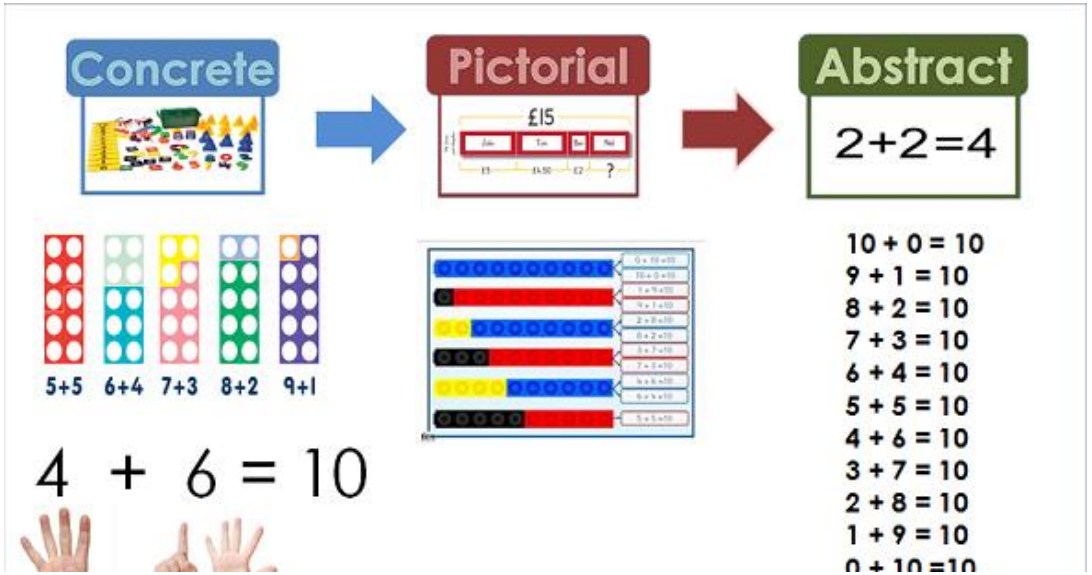
• 1.2 Part–part–whole – step 4:4

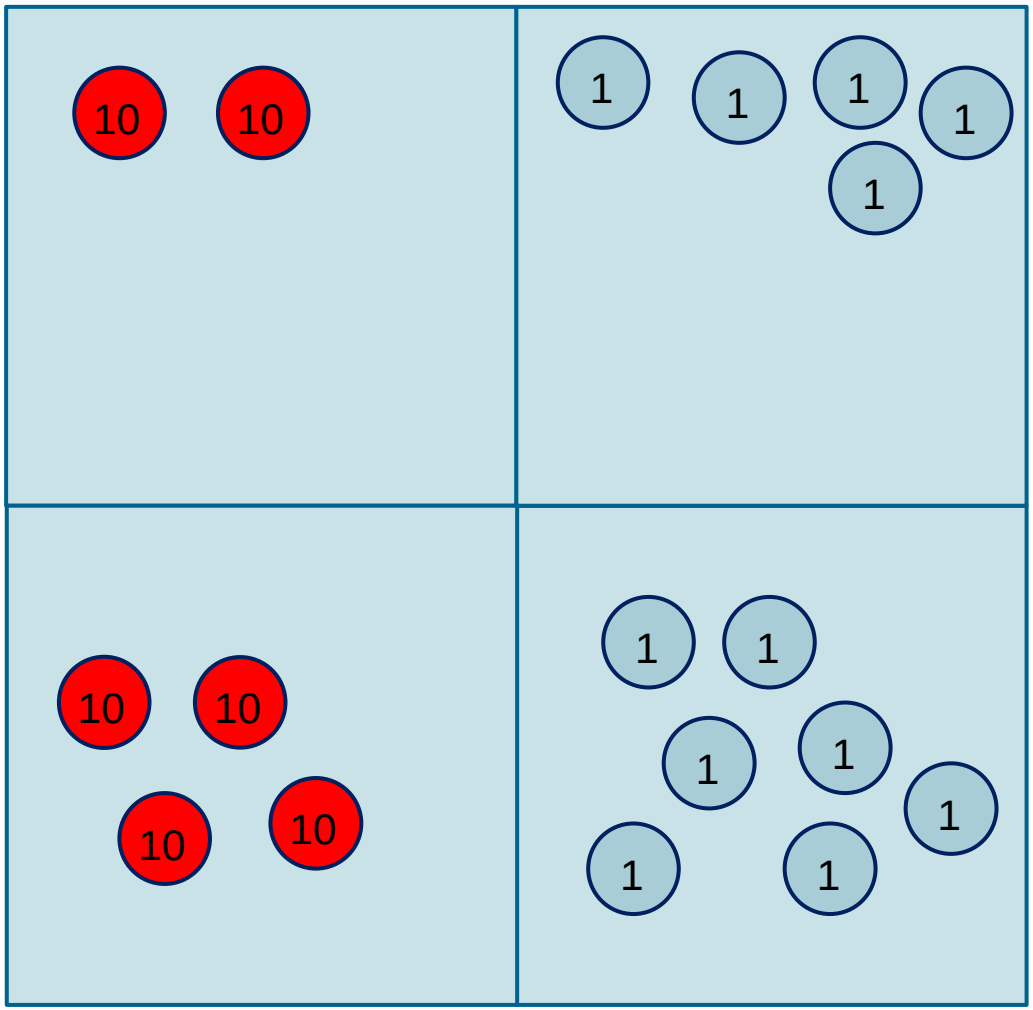


• 1.2 Part–part–whole – step 4:4

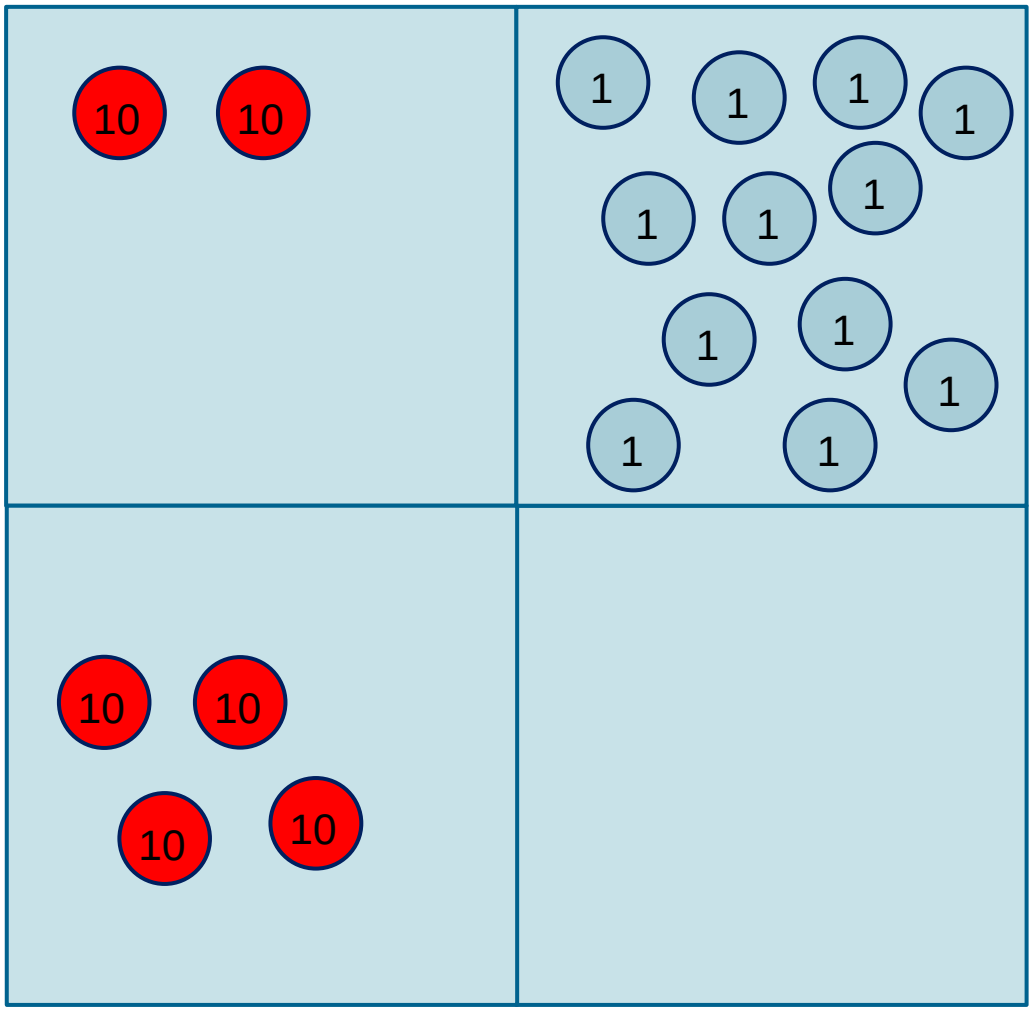


Your turn: CPA approach for the four operations



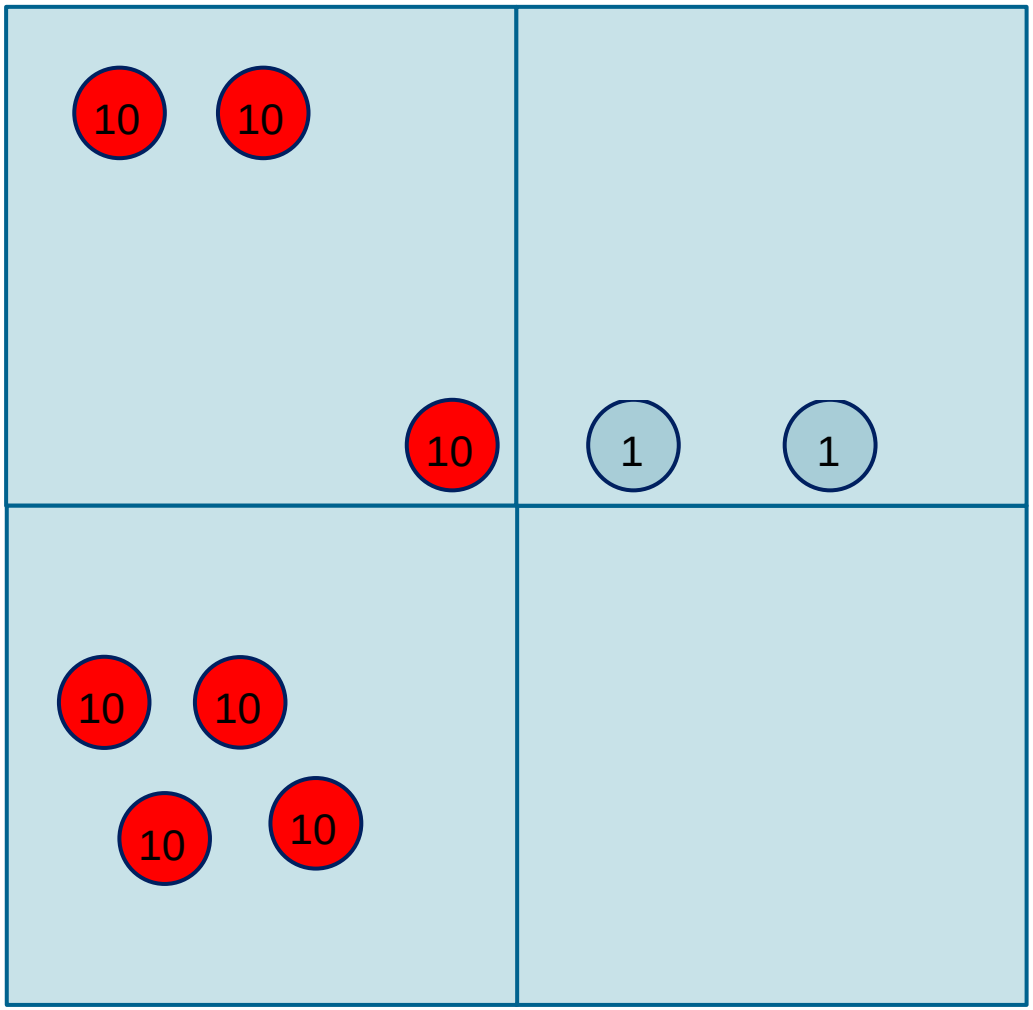


$$\begin{array}{r} 25 \\ +\,47 \\ \hline \\ \hline \end{array}$$

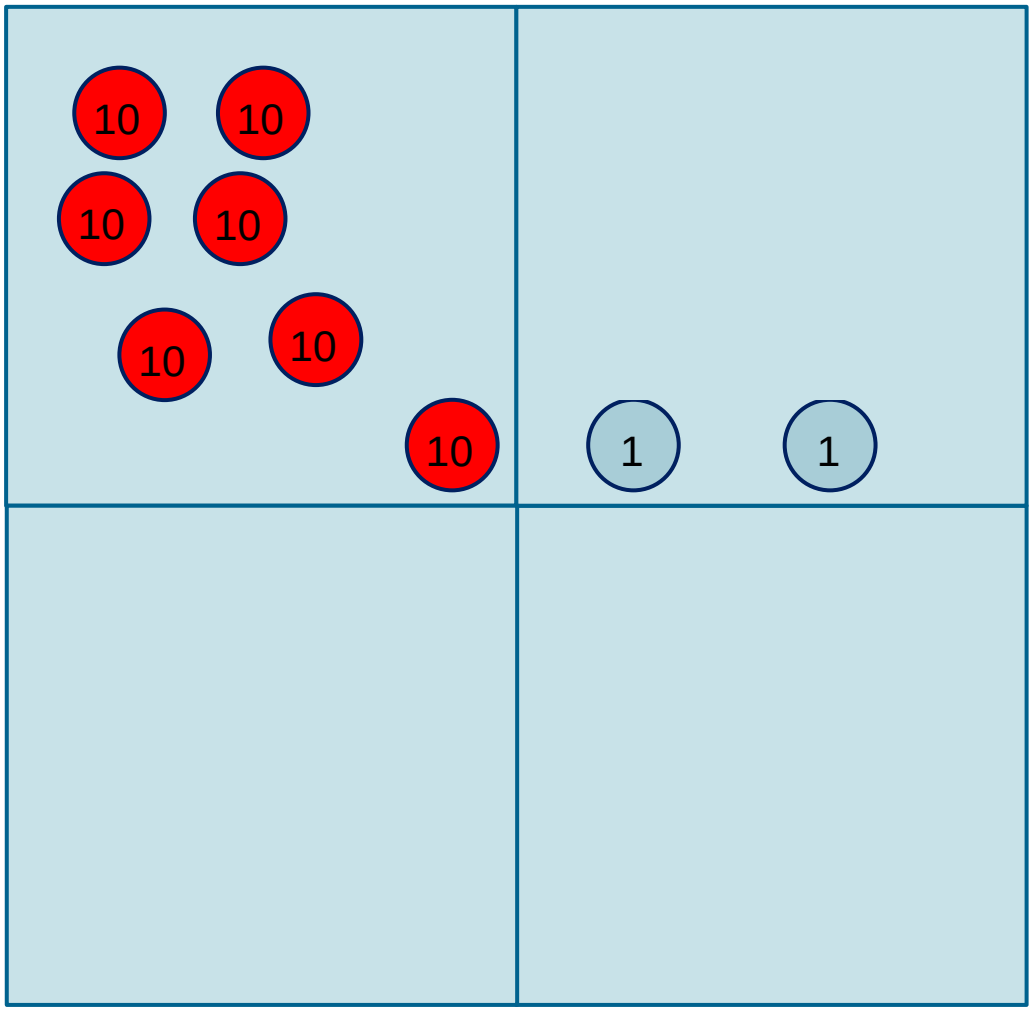


$$\begin{array}{r} 25 \\ +\,47 \\ \hline \\ \hline \end{array}$$

12



$$\begin{array}{r} 25 \\ +47 \\ \hline 2 \\ \hline 1 \end{array}$$



$$\begin{array}{r} 25 \\ +\,47 \\ \hline 72 \\ \hline 1 \end{array}$$

Task

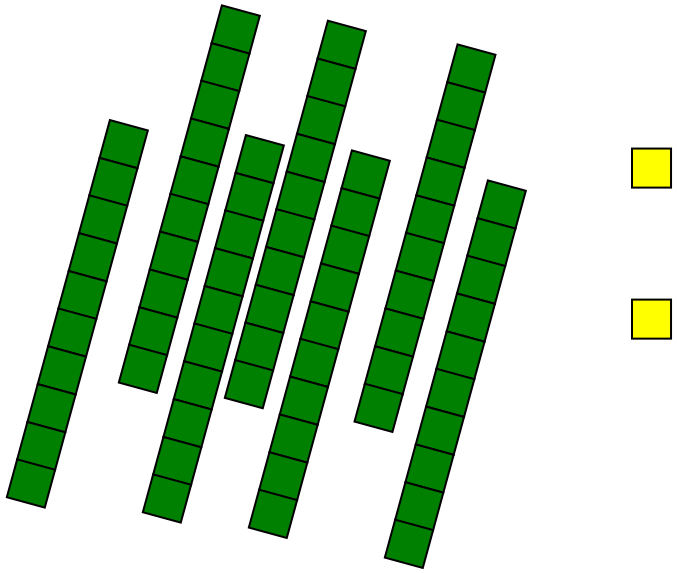
Explore some addition calculations using the different manipulatives.

36 + 29 **57 + 24**

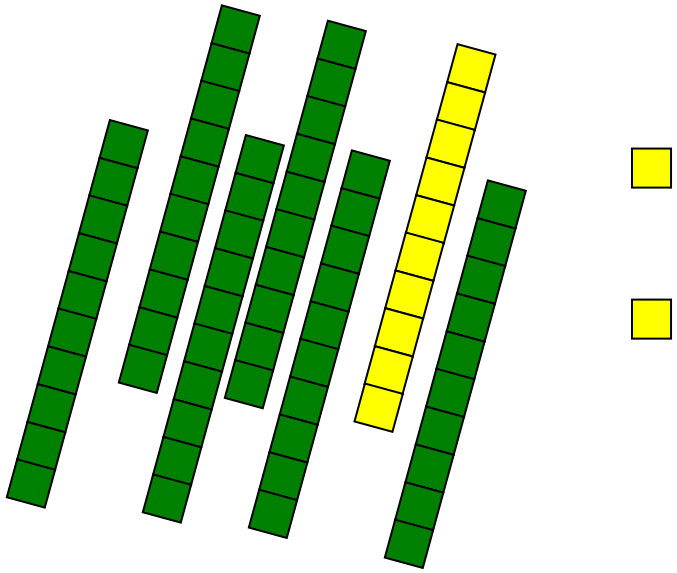
- How well do the manipulatives help you to solve the calculation problems?
- How well do the manipulatives help to move pupils towards written methods?

More than single digits?

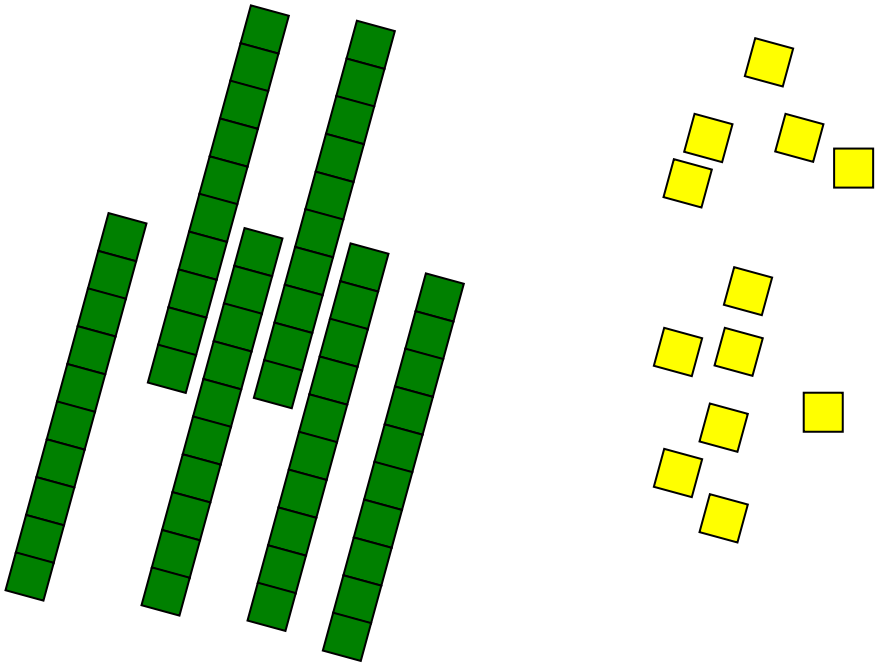
72 - 47

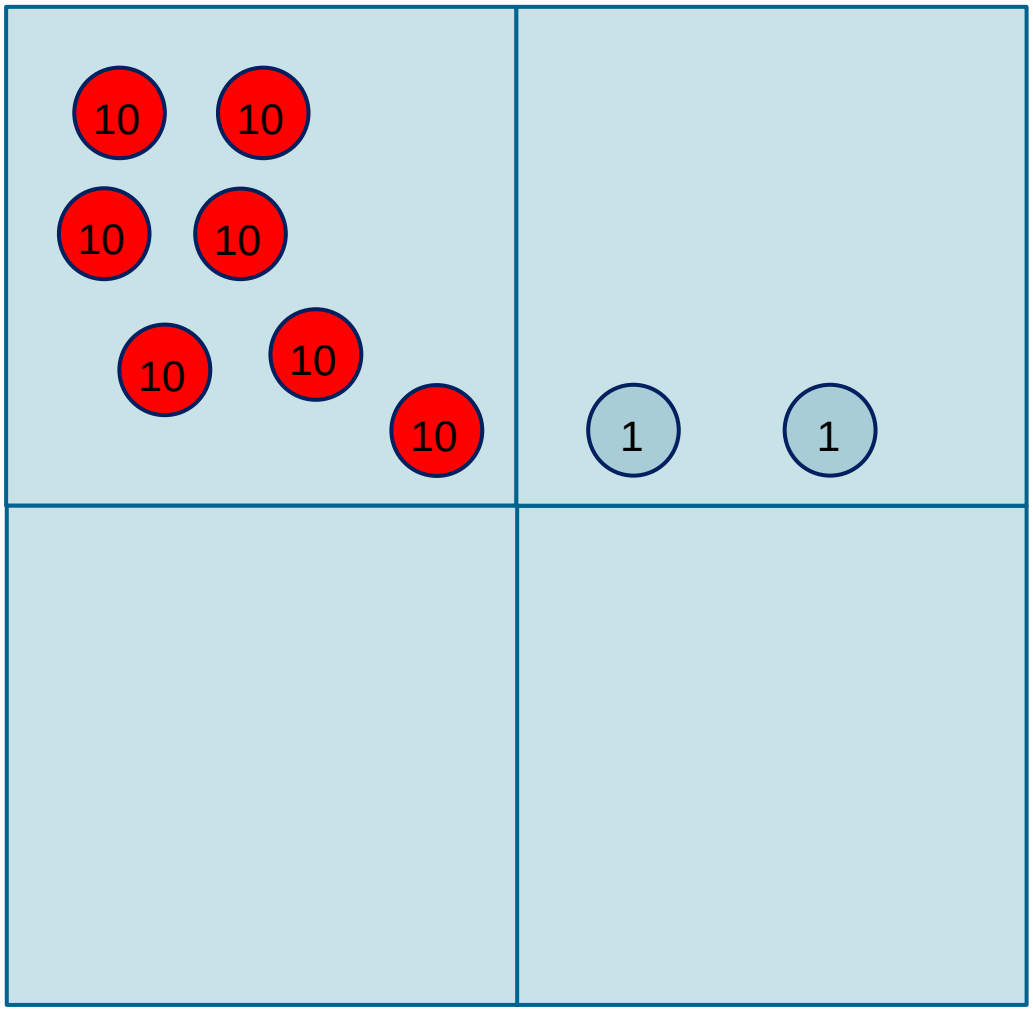


72 - 47

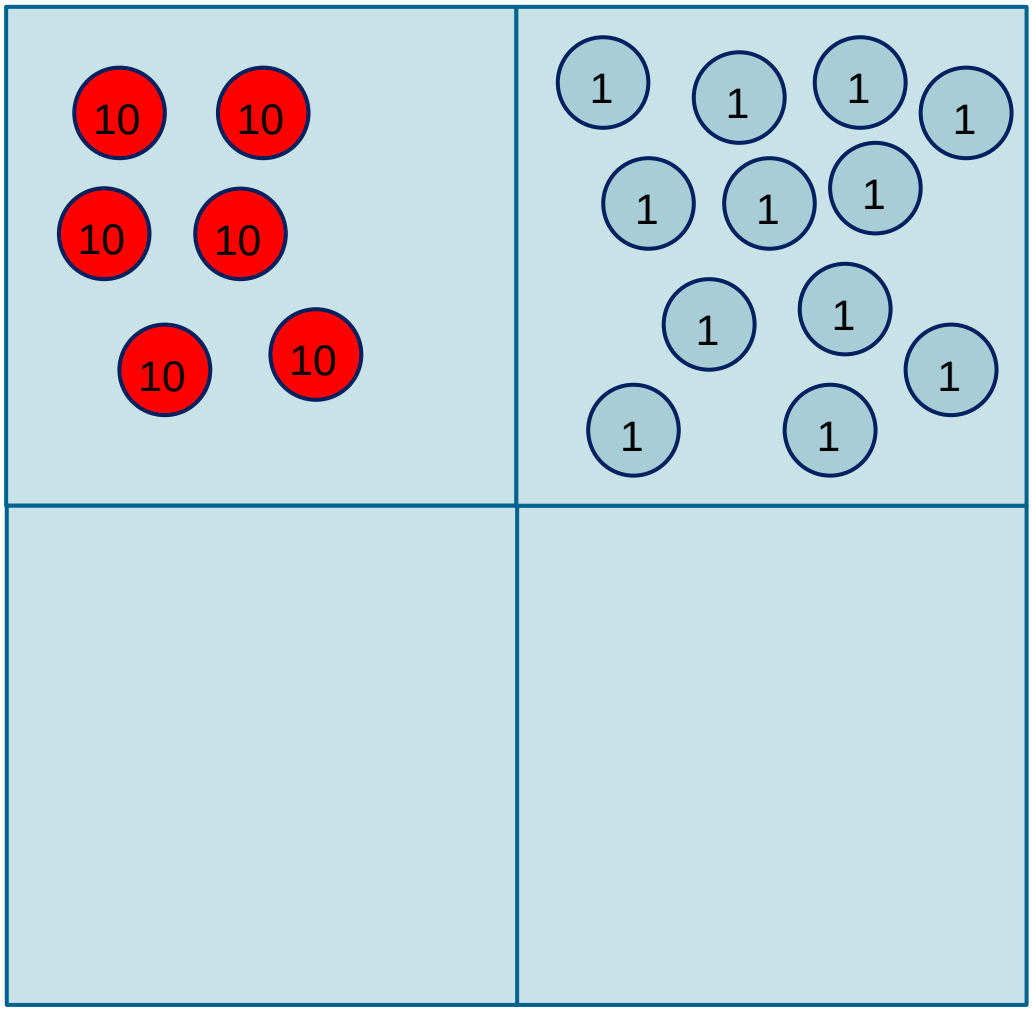


72 - 47

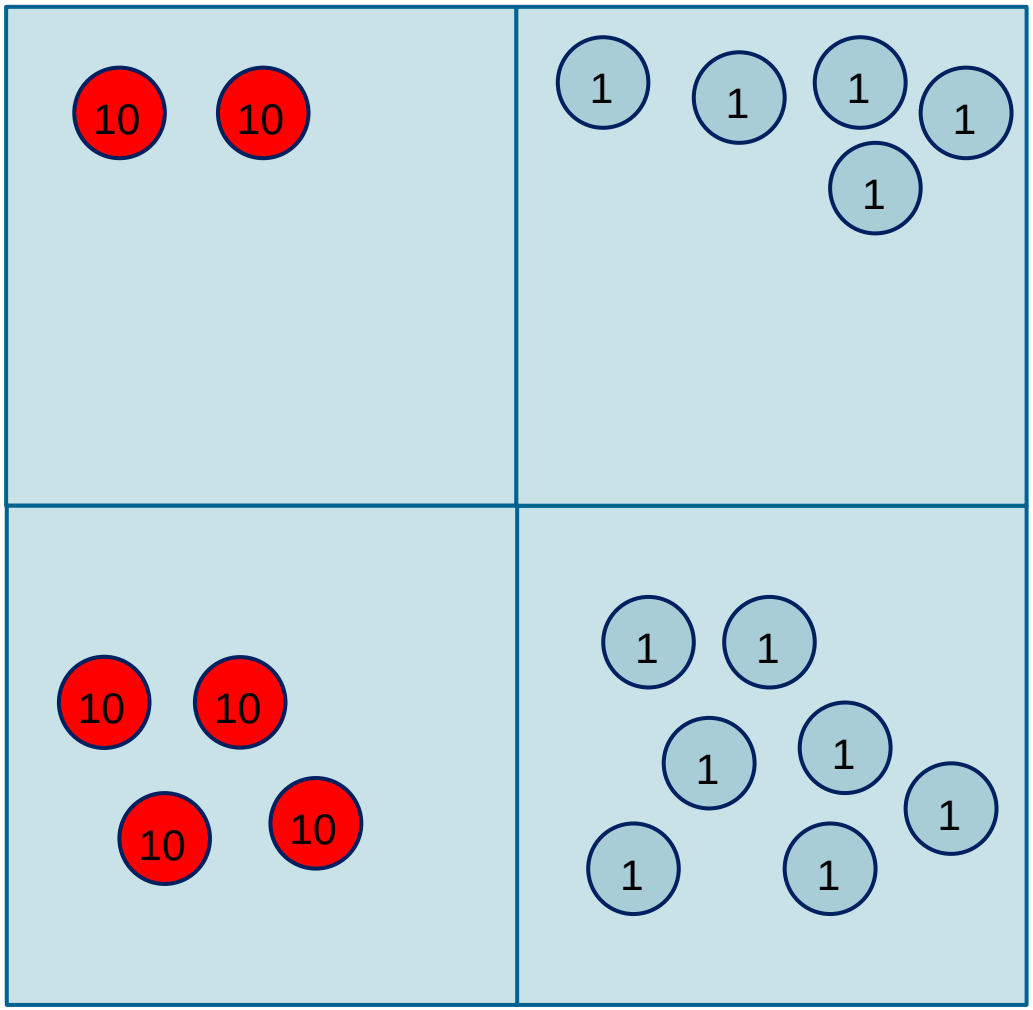




$$\begin{array}{r} 7\,2 \\ -\,4\,7 \\ \hline \\ \hline \end{array}$$



$$\begin{array}{r} {\scriptstyle 6}\,\not{7}\,{\scriptstyle 1}2 \\ -\ 4\ 7 \\ \hline \\ \hline \end{array}$$



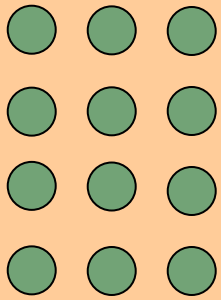
$$\begin{array}{r} {\scriptstyle 6}\,\not{7}\,{\scriptstyle 1}2 \\ -\ 4\ 7 \\ \hline 2\ 5 \end{array}$$

Task

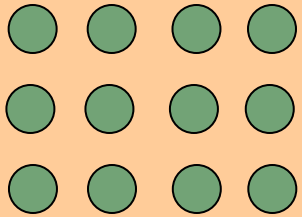
- **Explore some subtraction calculations using the different manipulatives.**

- **46 - 19 54 - 27**
  - How well do the manipulatives help you to solve the calculation problems?
  - How well do the manipulatives help to move pupils towards written methods?

Arrays

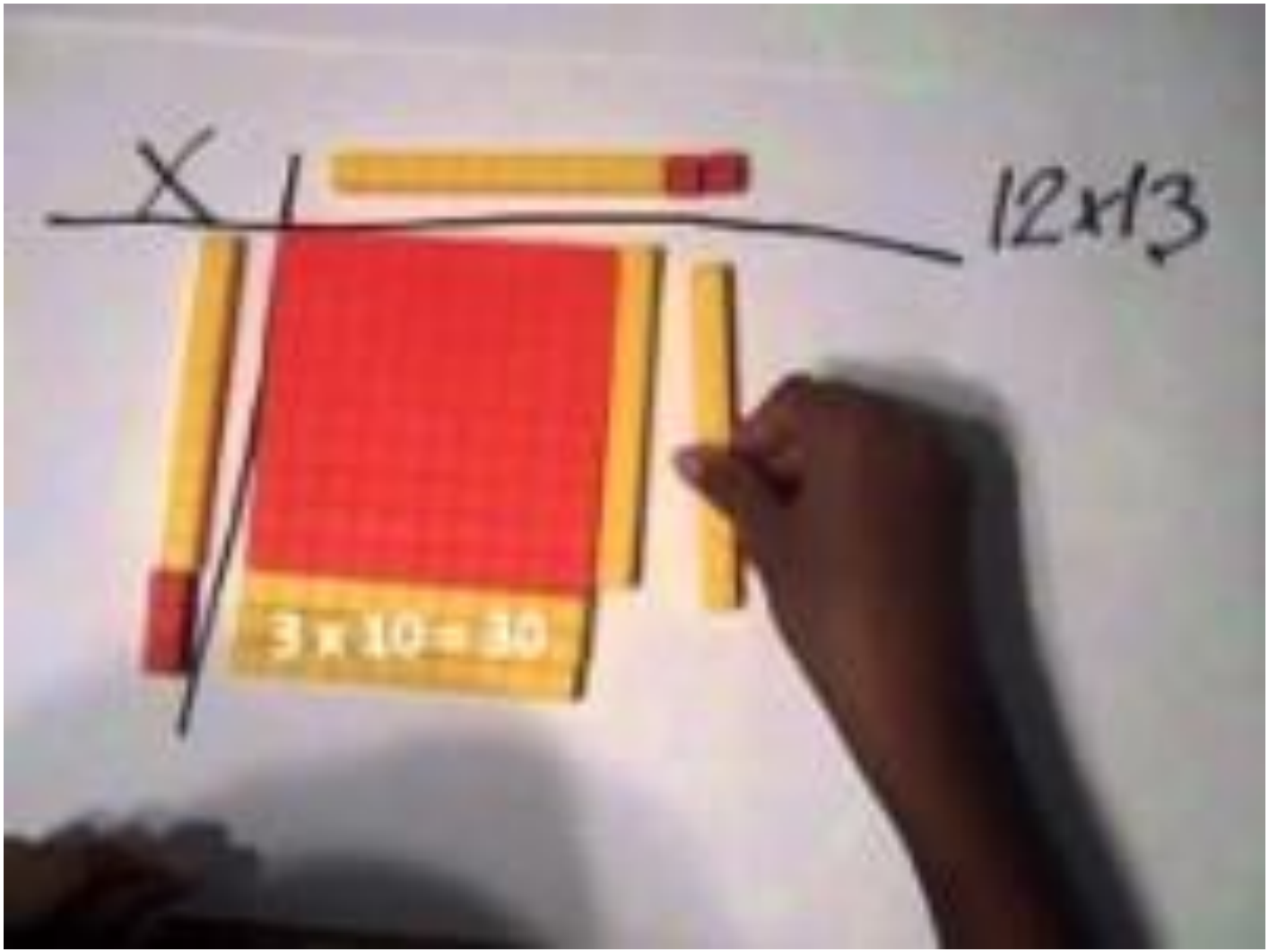


3×4



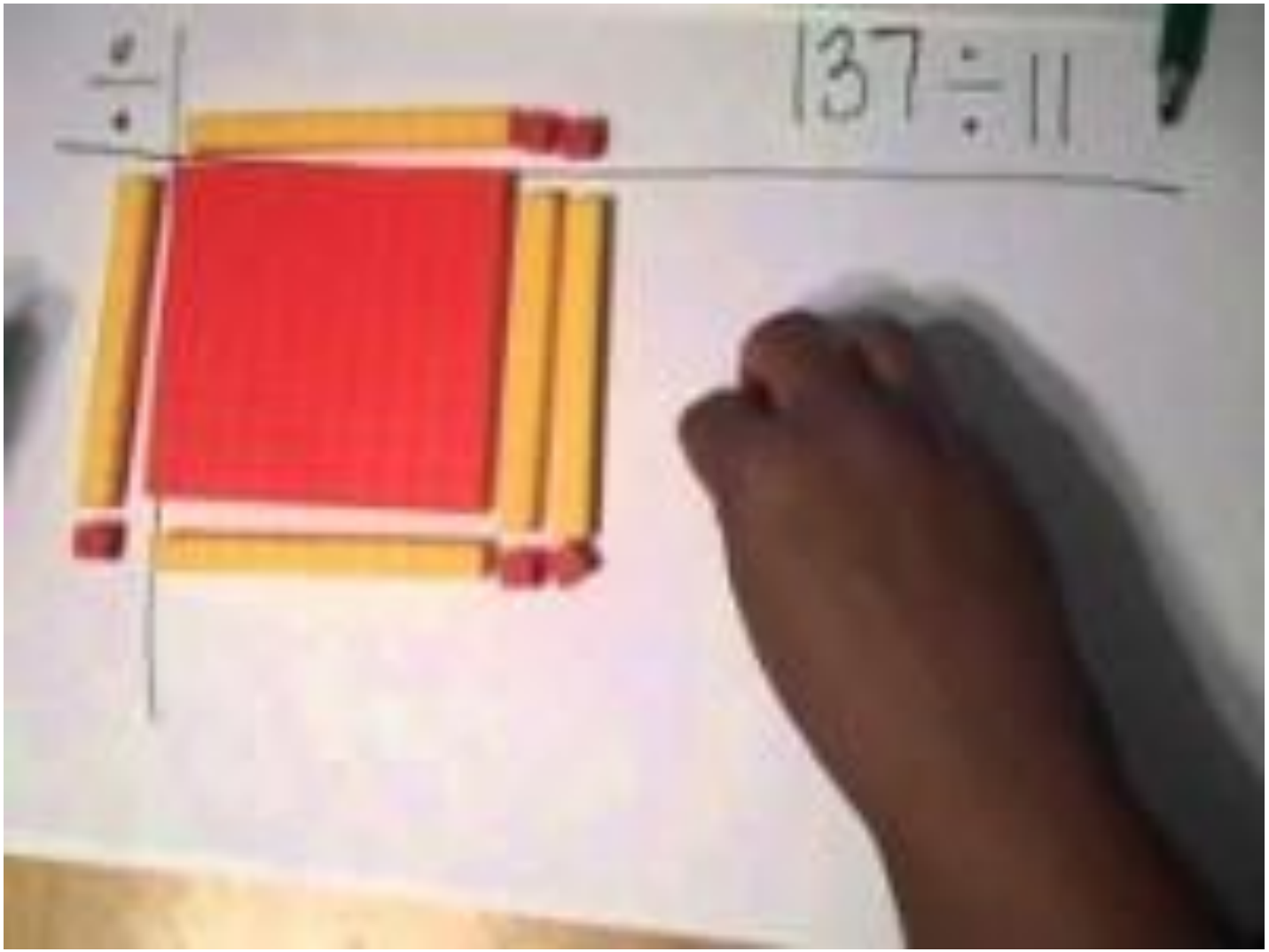
4×3

Using dienes to work out 12 x 13

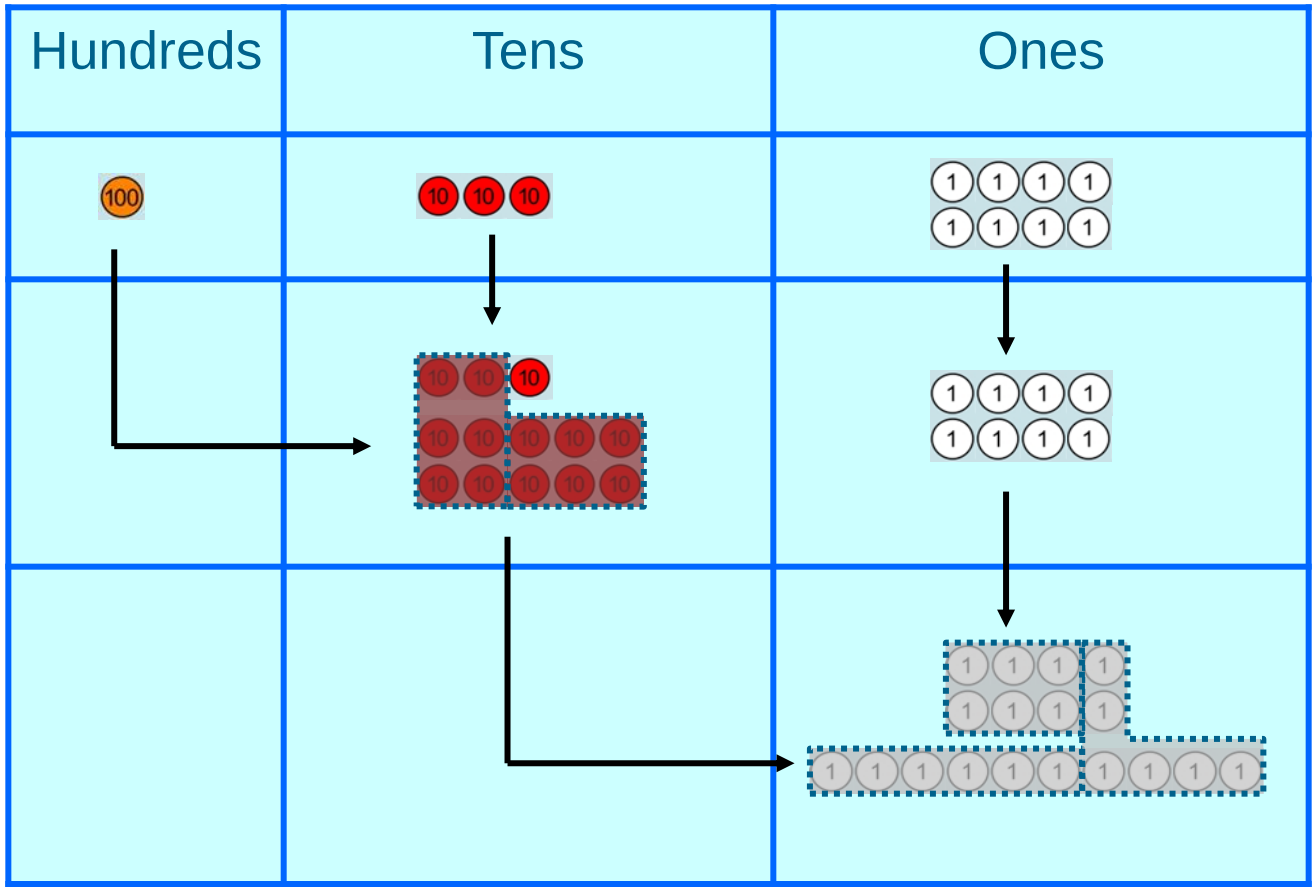


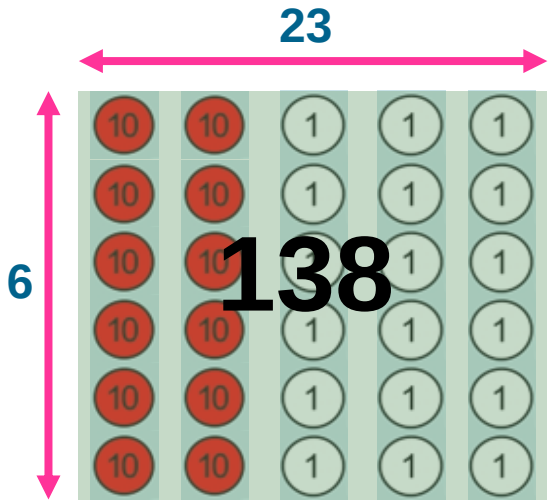
Teaching Short Division as a set of rules to remember

Using dienes to work out 137 ÷ 11



$$
\begin{array}{r|l}
 & 2\ 3 \\
\hline
6 & 1\ 3\ 8 \\
 & {\scriptstyle 0\ 1\ 1}
\end{array}
$$





Task

Explore some division calculations using the different manipulatives.

176 ÷ 8 **252 ÷ 7**

- How well do the manipulatives help you to solve the calculation problems?
- How well do the manipulatives help to move pupils towards written methods?
- Reflect on your own practice about how a written method for division can be taught.

Reflection

- What have been the key ideas for you?
- What has struck you as important?

Guide to manipulatives and how you can support at home…..

Parents and Carers

Information Guide to using Manipulatives

Summer 2023

Michelle Batstone

Introduction

Dear Parents and Carers,

Maths manipulatives refer to the hands-on resources used in maths classrooms to develop children's understanding of mathematical concepts, often in a practical, tactile way.

It was not long ago that these concrete resources were relegated to KS1 classrooms only. With increasing numbers of schools adopting a mastery approach to teaching maths, manipulatives are now a common feature of maths lessons across all classes at primary school - and even secondary school.

Initially, children need support and guidance on which manipulatives to select and how to use them. Over time, children are guided towards making their own choice of manipulatives - this allows them to take ownership of their own learning and development.

This information guide will look at some popular resources used across both schools of the Carey Federation and also share alternatives, such as on-line and do-it-yourself options, and provide you with example activity ideas to give you an idea of the versatility these resources can offer and support your child with their mathematics at home.

Michelle Batstone

DIENES BASE 10

- ✓ Dienes base 10 are an essential manipulative in any school.
- ✓ They are usually plastic (although we do have some older, wooden versions), consisting of ones cubes, tens rods, flat hundred squares and thousand blocks, which children can use to build and represent numbers.
- ✓ They are a fantastic visual way for children to understand the relationship between ones, tens, hundreds and thousands.

Dienes base 10 are predominantly used in Key Stage 1 and lower Key Stage 2, but some older children who are struggling with the concept of place value may benefit from using these. They are also useful in decimal representation in upper KS2.

As numbers get larger and children become more confident with the base 10 number system, this resource is usually replaced with place value counters.

This resource is brilliant for children being introduced to place value and the base 10 number system. Children begin by using the Dienes to represent numbers. They are also essential for children when they are first introduced to formal written methods of addition, subtraction, multiplication and division.

Dienes are particularly useful for helping children understand the concept of grouping/exchanging, as children are able to physically exchange the blocks, for example, ten ones cubes for a ten rod, or a ten rod for ten ones cubes.

Free Online
https://mathsbot.com/manipulatives/blocks

Do-it-yourself

Bundles of 10 straws

PLACE VALUE COUNTERS

- ✓ Place value counters are the next step in the progression from concrete Base 10 towards a more abstract understanding of place value.
- ✓ They serve a similar purpose to the Dienes Base 10, but with the key difference being that they are all the same size.
- ✓ This enables pupils to work with much larger numbers, in addition to progressing on to decimal numbers.
- ✓ They also ensure children are not over-reliant on being able to see the difference in size to understand the concept of the base 10 number system.

Place value counters are an essential resource for children in Key Stage 2.

Place value counters are very useful for children to understand the concept of place value and can be used for much larger numbers than the Dienes.

In addition to the place value of whole numbers, they are also useful for children's introduction to decimal numbers.

Place value counters are also very helpful for children learning the formal written methods of addition, subtraction, multiplication and division.

Free Online
https://mathsbot.com/manipulatives/placeValueCounters

Do-it-yourself

Milk bottle tops

2-SIDED COUNTERS

- ✓ 2-sided counters are a simple but very effective resource.
- ✓ They are plastic counters with one colour on one side and a different colour on the other.
- ✓ They have a diverse range of uses and can be used to support a wide range of maths concepts across all year groups.

2-sided counters are one of the of the few resources which are useful all the way from EYFS through to Year 6.

2-sided counters have a wide range of uses, including place value, written calculations, fractions, ratio and algebra.

Free Online
https://mathsbot.com/manipulatives/twoSidedCounters

Do-it-yourself

Stick 2 colour discs (circles) pierced on cord together

NUMICON

- ✓ Numicon consists of different coloured, flat plastic shapes.
- ✓ Each shape contains holes, representing numbers from 1 to 10 and is an excellent, multi-sensory way for children to develop number sense.
- ✓ The patterns are structured so that number relationships can be seen and experienced.
- ✓ The pieces are also weighted according to size, giving an added dimension to how they can be used.

Numicon can be used across the school from EYFS to Year 6. It can be used as a whole class or with smaller groups as an intervention resource.

Numicon can be used to teach a wide range of concepts, such as: place value, written calculations, fractions, decimals and percentages, as well as number bonds, odds and evens.

Free Online
https://mathsbot.com/manipulatives/numicon

REKENREK

- ✓ The Rekenreks (meaning 'counting racks') have gained popularity in recent years.
- ✓ Rekenreks are composed of 20 beads in two rows of ten or 100 beads in ten rows of ten, with five red and five white beads on each rod.
- ✓ They provide a visual model encouraging children to build numbers in groups of five and ten and to use doubling and halving strategies and to solve addition and subtraction problems.
- ✓ Repeated use of this resource leads to mental images, which in turn leads to the automaticity of number facts.

Rekenreks are used primarily in EYFS and Key Stage 1 but can be used to support children further up the school.

Rekenreks are a good visual resource to help children to visualise numbers and improve their addition/ subtraction strategies, such as doubling or finding near doubles.

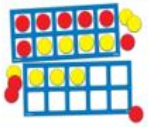
Supports children to conceptually subitise (one pack 6 - 5 of one colour 1 of another).

Do-it-yourself

Watch a video here: https://www.youtube.com/watch?v=aWkkcEwF_ak

Free Online
https://mathsbot.com/manipulatives/rekenrek

TENS FRAMES



- ✓ Tens frames are rectangular frames split into ten sections.
- ✓ Thinking about numbers using a tens frame can be a helpful way for children to learn basic number facts.
- ✓ They help children to visualise numbers within ten and beyond and are a great tool for helping to develop number sense.
- ✓ For older children, tens frames are useful for helping to understand and visualise decimal numbers, including addition and subtraction of decimals.

Tens frames are useful across all key stages from EYFS to Year 6.

For younger children, tens frames are a great resource for counting, place value, addition/subtraction of numbers within 10 and 20.

For older children, the value of the tens frame becomes one, with each section representing 0.1.

Using the manipulative in this way enables children to visualise and understand decimal numbers, in addition to helping to visualise addition and subtraction of decimal numbers.

Do-it-yourself

Use buttons, pasta, cereal pieces, coins or anything you can get your hands on!

Free Online
https://mathsbot.com/manipulatives/tenFrame

CUISENAIRE RODS

- ✓ Cuisenaire rods are plastic or wooden and are colour coded depending on their size (from 1cm to 10cm).
- ✓ They provide an interactive, hands-on way to explore maths concepts, such as number bonds, fractions, decimals and ratio

A useful resource for both Key Stage 1 and Key Stage 2 classrooms.

Cuisenaire rods are very versatile and can be used to teach a wide range of concepts, including number bonds, patterns, fractions, decimals, scaling, ratio and as a concrete aid when using bar models.

Free Online
https://mathsbot.com/manipulatives/cuisRods

Early Years and Key Stage 1 Links to Numberblocks Step Squad

Numberblocks Online
https://www.bbc.co.uk/cbeebies/shows/numberblocks

EXTRA READING AND SUPPORT

- Numicon Support Videos
- Mathsbot
- How manipulatives are transforming mathematics in Key Stage 2
- Concrete resources for Parents: How you can transform maths learning at home
- https://www.theschoolrun.com/what-concrete-pictorial-abstract-approach-maths

Thank you