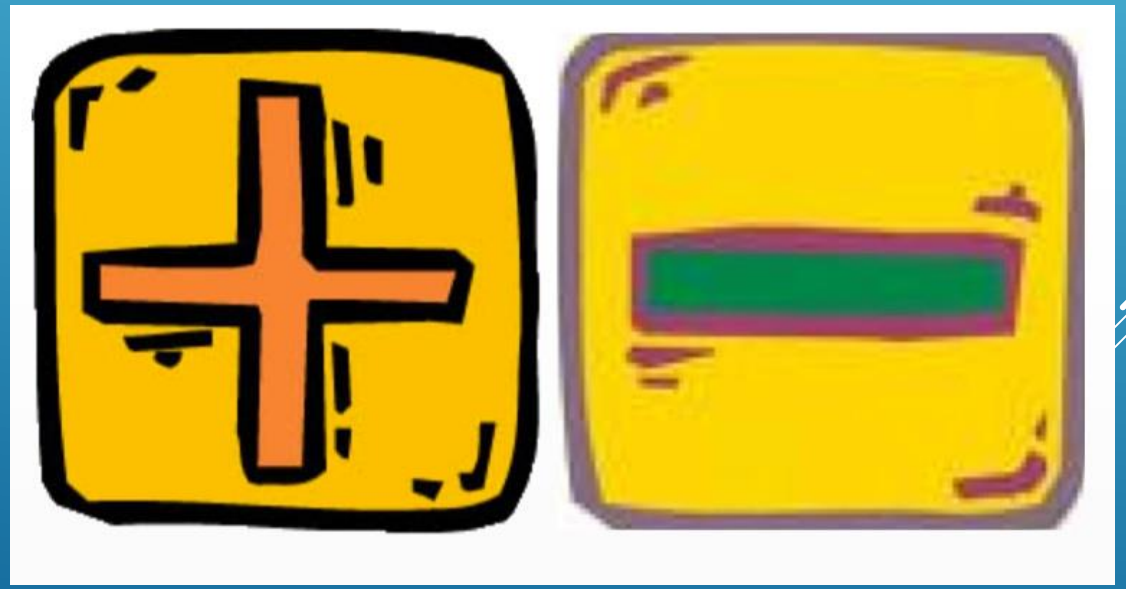
KS2 Calculation: Parent Workshop



OBJECTIVES

- To understand the addition and subtraction strategies taught at Days Lane in KS2.
- To understand the CPA approach of addition and subtraction.
- To know how to support your child at home with addition and subtraction.

NATIONAL CURRICULUM EXPECTATIONS – YEAR 3

Statutory requirements

Pupils should be taught to:

- add and subtract numbers mentally, including:
  - a three-digit number and ones
  - a three-digit number and tens
  - a three-digit number and hundreds
- add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

NATIONAL CURRICULUM EXPECTATIONS – YEAR 4

Statutory requirements

Pupils should be taught to:

- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.

NATIONAL CURRICULUM EXPECTATIONS – YEAR 5

Statutory requirements
Pupils should be taught to: ▪ add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) ▪ add and subtract numbers mentally with increasingly large numbers ▪ use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy ▪ solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

NATIONAL CURRICULUM EXPECTATIONS – YEAR 6

Statutory requirements

Pupils should be taught to:

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
- divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- perform mental calculations, including with mixed operations and large numbers
- identify common factors, common multiples and prime numbers
- use their knowledge of the order of operations to carry out calculations involving the four operations
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Statutory requirements

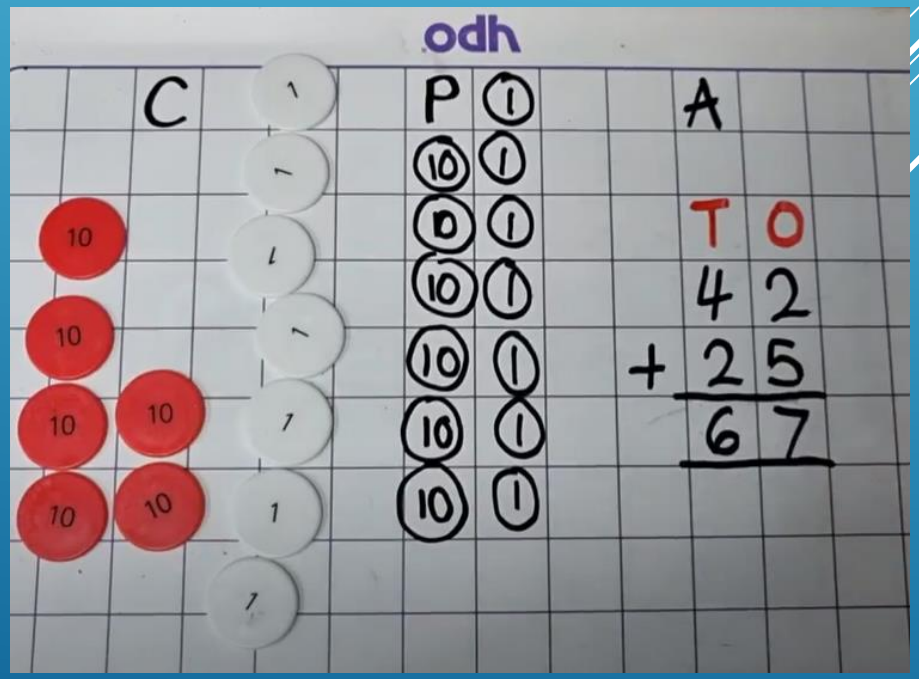
- solve problems involving addition, subtraction, multiplication and division
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.

KS2 SATs

Children are expected to apply their knowledge in different contexts using their prior knowledge from Year 3 up.

WHAT IS THE CPA APPROACH?

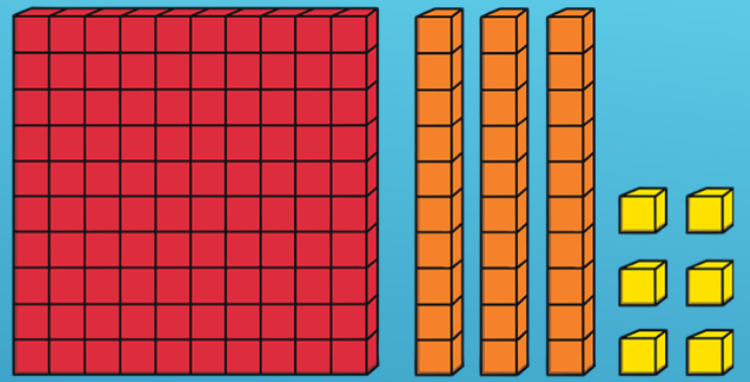
- Concrete, Pictorial, Abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths in pupils. CPA was developed by American psychologist Jerome Bruner. It is an essential technique within the method of teaching maths for mastery.
- Children often find maths difficult because it is abstract. The CPA approach helps children learn new ideas and build on their existing knowledge by introducing abstract concepts in a more familiar and tangible way.
- The CPA method involves using actual objects for children to add, subtract, multiply or divide. They then progress to using pictorial representations of the object, and ultimately, abstract symbols.



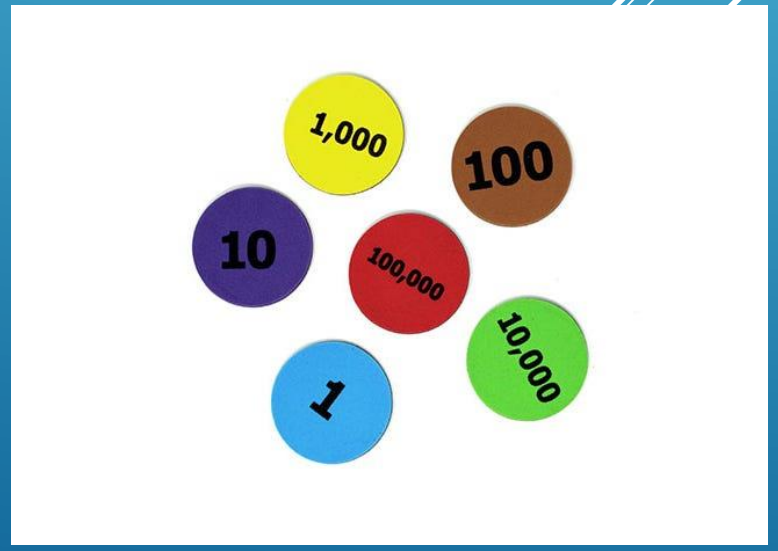
CONCRETE

- At Days Lane in KS2 we use a range of concrete representations such as place value counters and Base 10.
- They would have had experience with this in KS1 too, including using Numicon.

Base 10



Place Value Counters

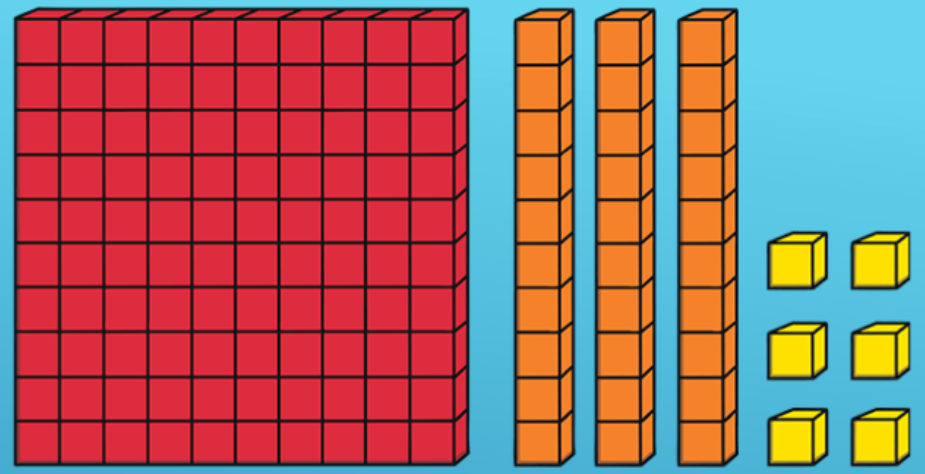


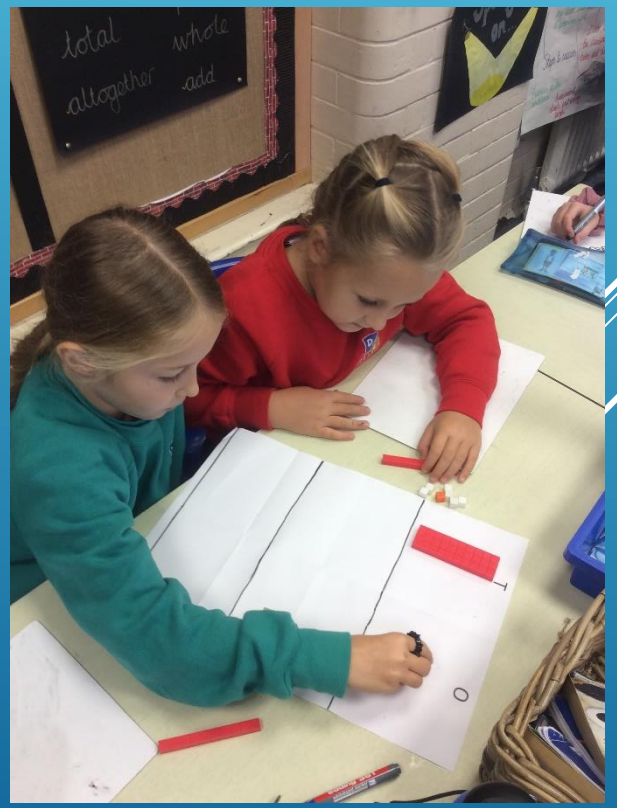
"Concrete materials, coupled with good teaching practice and strong teacher content knowledge, provide **opportunities for learners to construct rich understandings of mathematical concepts**"

Base 10

- Base 10 refers to the place value number system that most languages around the world use to express numerical quantities.

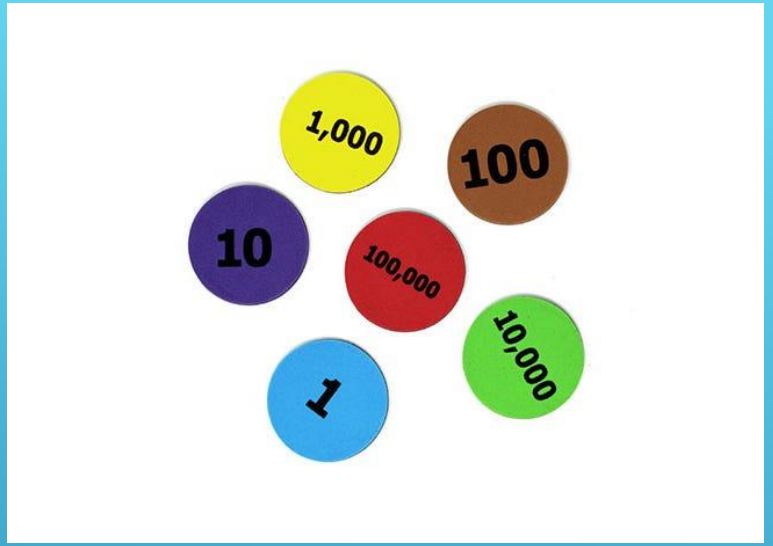
  In the base 10 system, each number is composed of digits. For example, in the number 301, 3, 0 and 1 are each digits. When they are combined in a certain pattern, they mean the number 301. If we use the same digits but rearrange their order to 103, we are expressing a totally different number. This is because each of these digits holds a place value which denotes its meaning. This is the same for decimals.

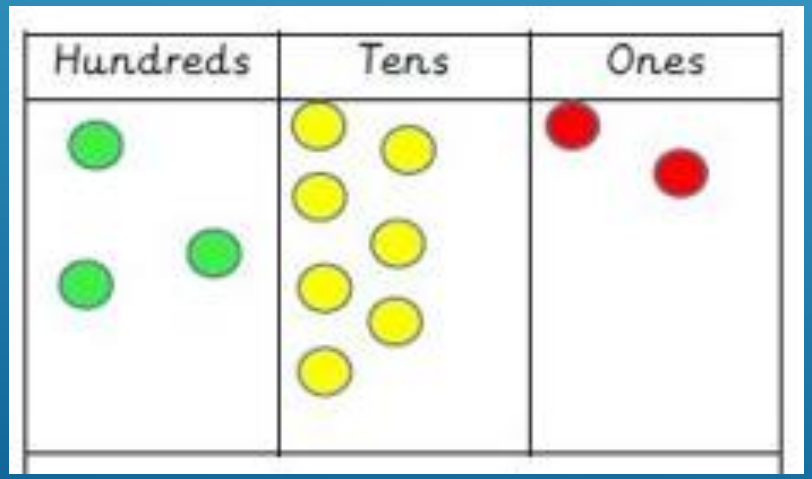


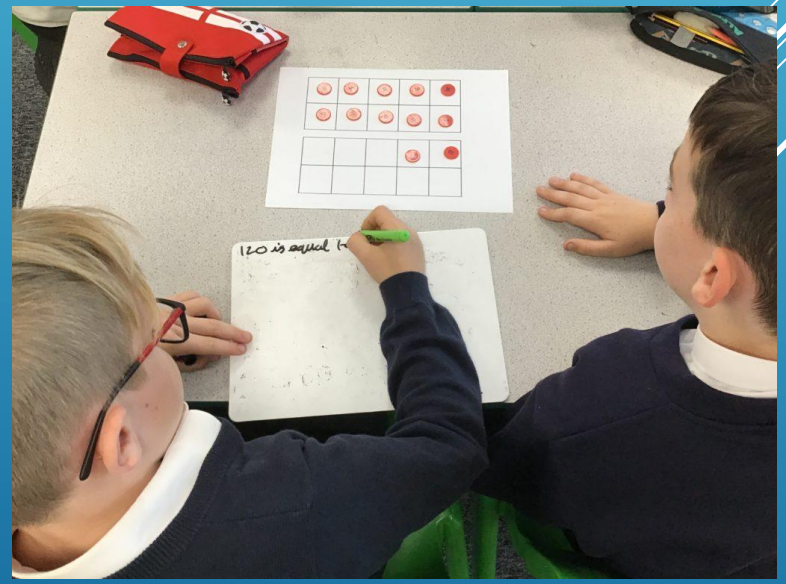


Place Value Counters

- Place Value Counters are another manipulative that works on the place value number system.
- Children can then use their understanding when using and moving onto the pictorial approach!



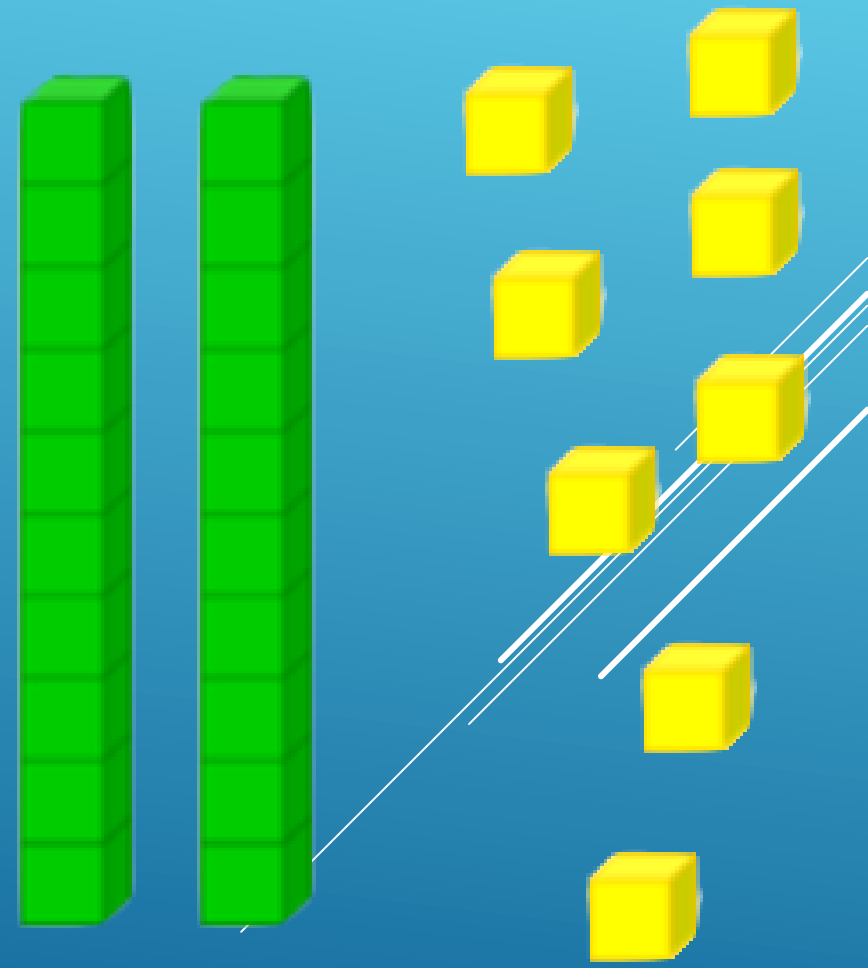




CONCRETE

Addition- 2 digit by 2 digit

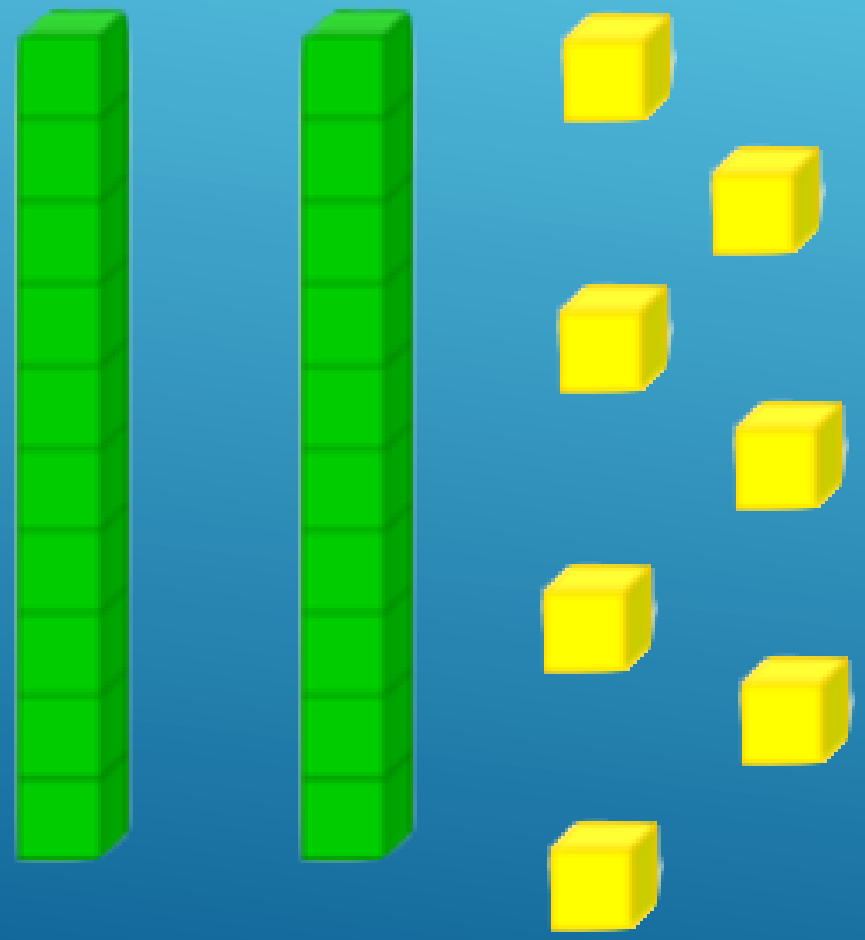
15 + 13 =



CONCRETE

Subtraction – 2 digit by 1 digit

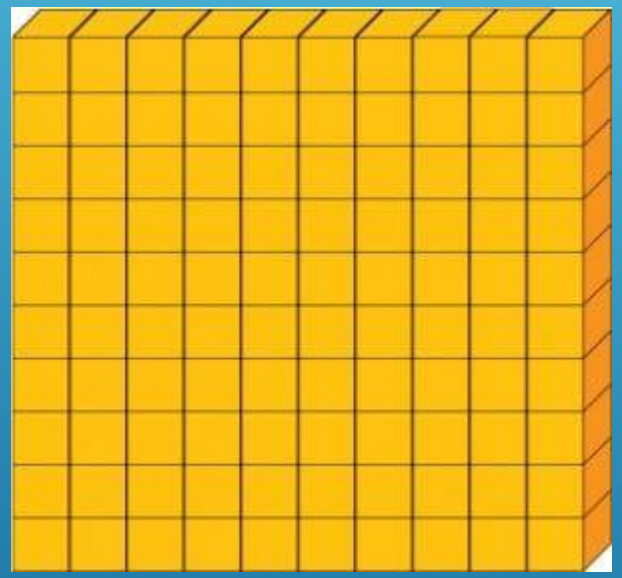
27 – 13 =

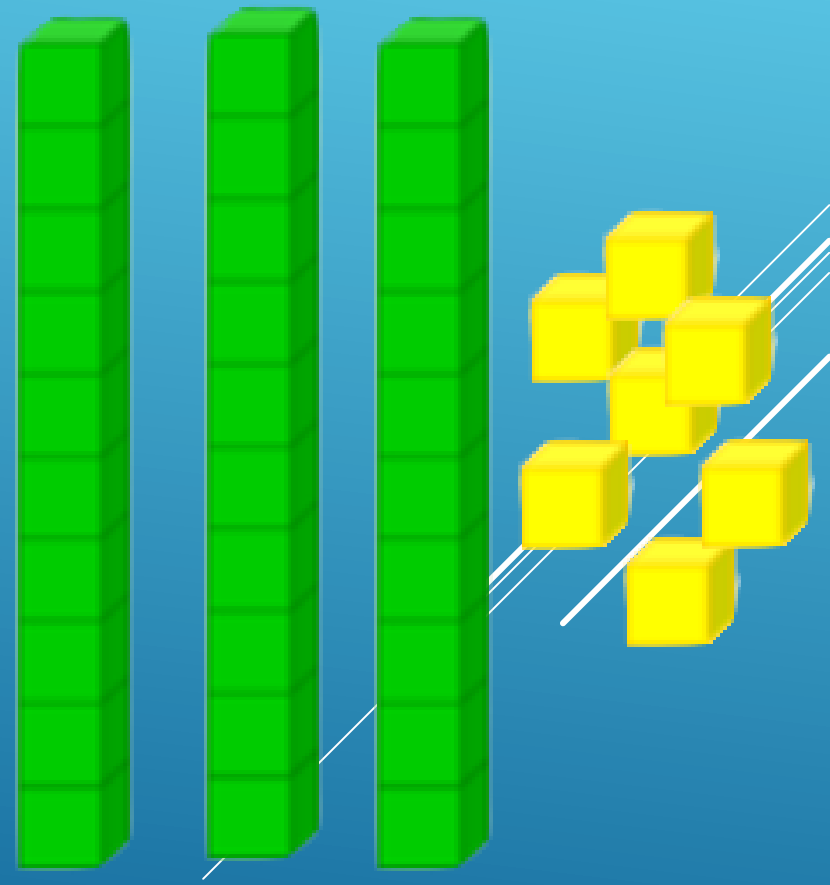


CONCRETE

Addition- a three digit number by tens

115 + 23 =

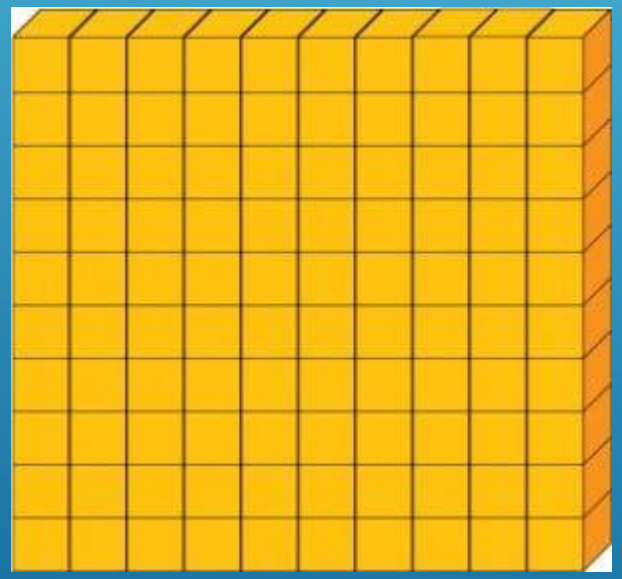


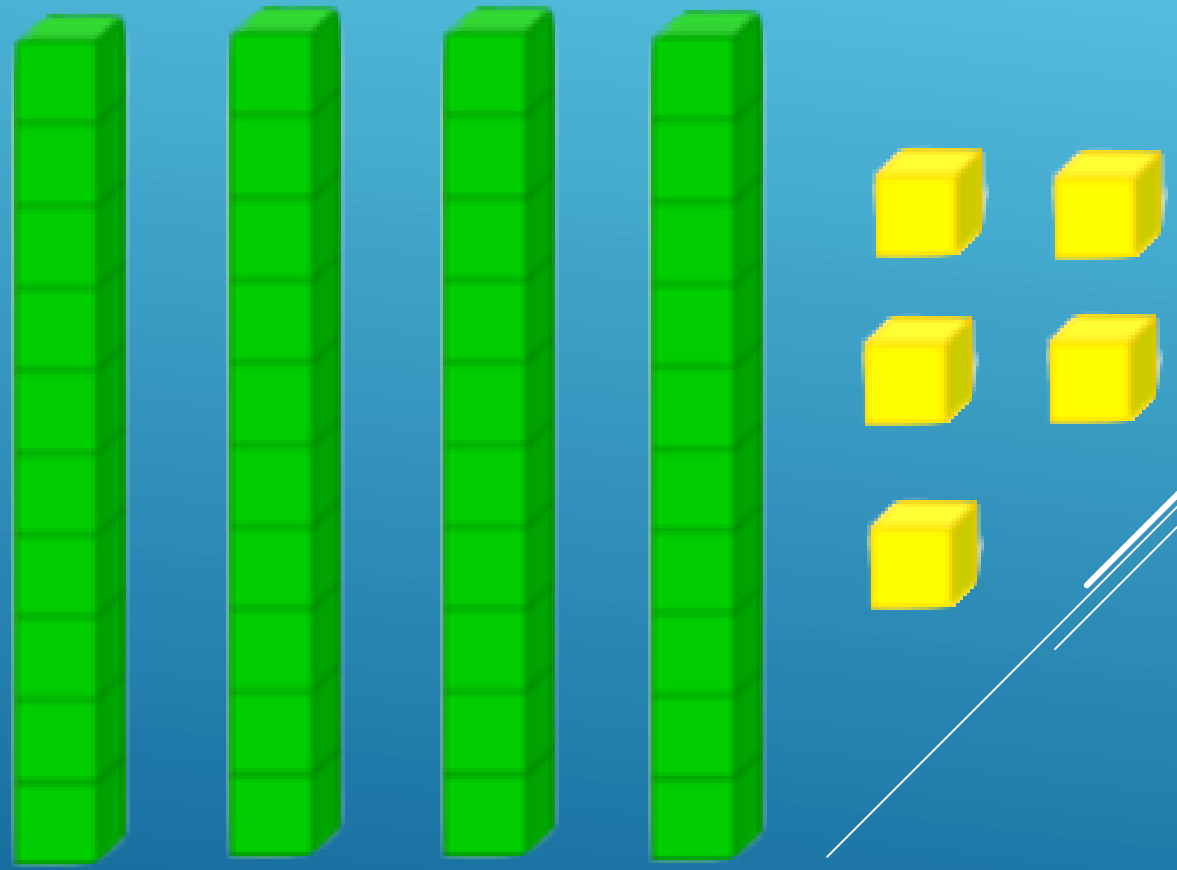


CONCRETE

Subtraction- a three digit number by tens

145 - 23 =





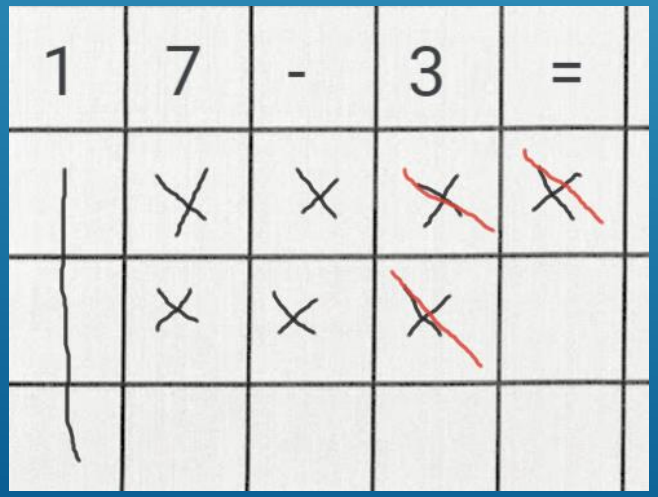
CONCRETE

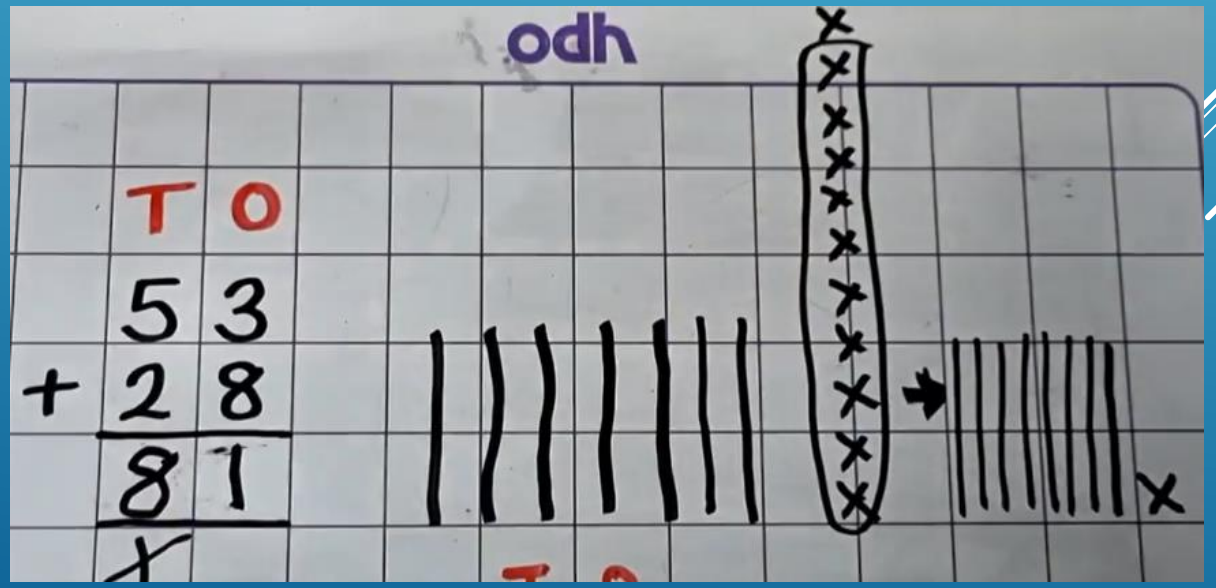
Addition – Bridging

27 + 9 =

PICTORIAL

- Once children have understood the concrete stage to addition and subtraction they can move onto the pictorial stage.
- The pictorial stage requires the children to draw simple pictures to represent the numbers in the equation.
- We draw crosses to represent the ones in a number, lines to represent the tens and squares to represent hundreds. This is consistent across the school.





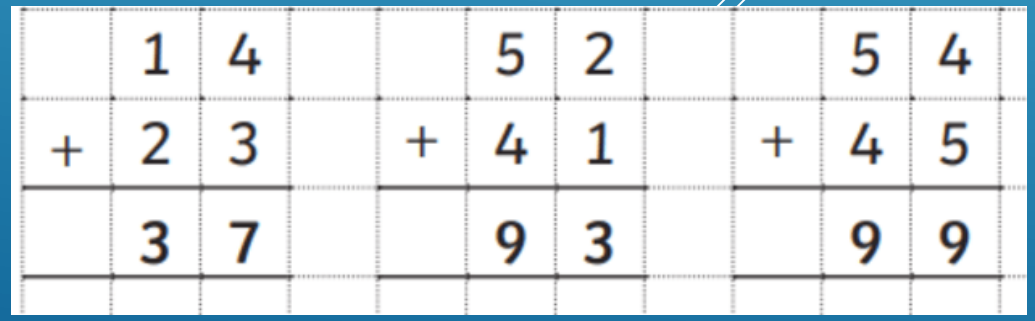
PICTORIAL

3	4	+	2	7	=

	4	2	-	1	9	=	

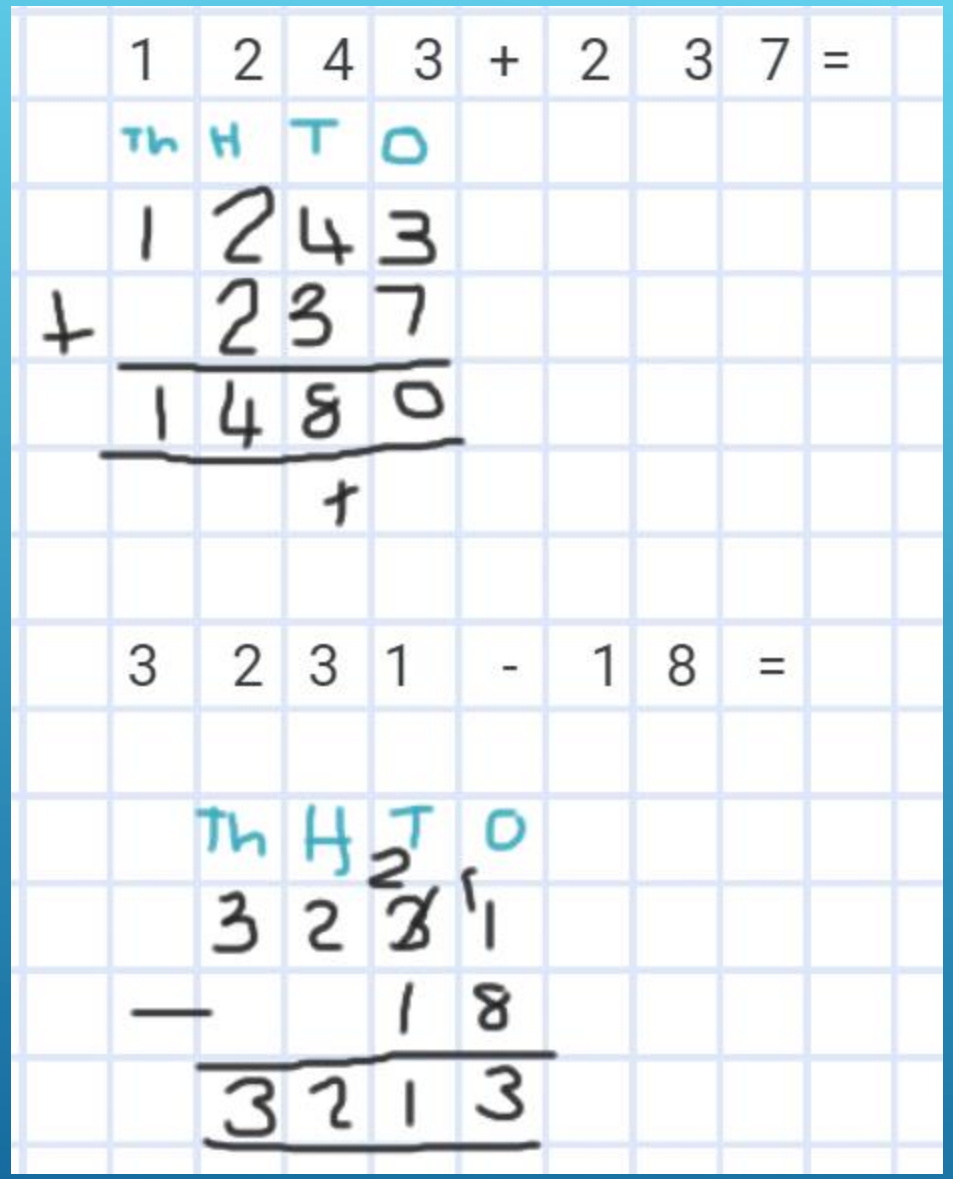
ABSTRACT

- The abstract stage involves the introduction of abstract concepts such as the written representation of number and mathematical symbols.
- It is important that children have a secure understanding of the concrete and pictorial stages before being introduced to this stage. This way misconceptions are easier to pick up on and address.
- At Days Lane we look at the concrete, pictorial and abstract representations alongside one another to solidify children's understanding.
- The column method is another example of the abstract stage. This is something the children are introduced to in Year 3 when they have a deeper understanding of number and place value.



	1	4			5	2			5	4
+	2	3		+	4	1		+	4	5
	3	7			9	3			9	9

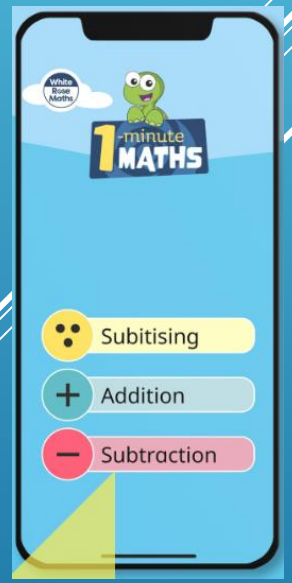
ABSTRACT



HOW CAN YOU HELP AT HOME?

- Encourage children to solve equations using concrete objects or by drawing pictorial representations. Ensure this is understood before moving onto the abstract.
- Numicon, place value counters and base 10 are available to buy at several online retailers. Alternatively you can find online versions to use at home (see links below).
- At home, you can use other objects around the house for the concrete stage of addition and subtraction (lego blocks, counters, etc).

- Once children understand the concrete and pictorial representations of equations, you may wish to practice solving addition and subtraction mentally through the use of number bonds and related known facts.
- White Rose – 1 minute maths app. This helps your child to build greater number confidence and fluency. It's all about targeted practice in engaging, one-minute chunks!



Numicon- Online Resource
https://mathsbot.com/manipulatives/numberFrames

Place Value - Online Resource
https://mathsbot.com/manipulatives/placeValueCounters

Base 10 – Online Resource
https://mathsbot.com/manipulatives/blocks

ANY QUESTIONS?