KS2 Calculation:
Parent Workshop
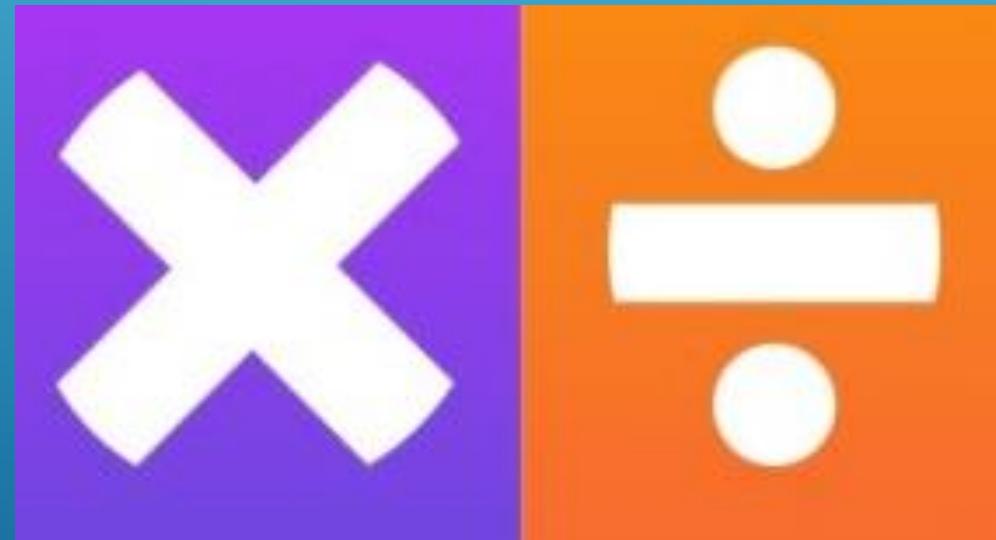
OBJECTIVES

➢ **To understand the multiplication and division strategies taught at Days Lane in KS2.**

➢ **To understand the CPA approach of multiplication and division .**

➢ **To know how to support your child at home with multiplication and division .**

NATIONAL CURRICULUM EXPECTATIONS – YEAR 3

Statutory requirements

Pupils should be taught to:

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables

- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

NATIONAL CURRICULUM EXPECTATIONS – YEAR 4

Statutory requirements

Pupils should be taught to:

- recall multiplication and division facts for multiplication tables up to 12 × 12

- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers

- recognise and use factor pairs and commutativity in mental calculations

- multiply two-digit and three-digit numbers by a one-digit number using formal written layout

- solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

NATIONAL CURRICULUM EXPECTATIONS – YEAR 5

Statutory requirements

Pupils should be taught to:

- identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers

- know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers

- establish whether a number up to 100 is prime and recall prime numbers up to 19

- multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers

- multiply and divide numbers mentally drawing upon known facts

- divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context

- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000

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. 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 mostly use place value counters, as well as other manipulatives.

➤ They would have had experience with this in KS1 too, including using Numicon.

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**"
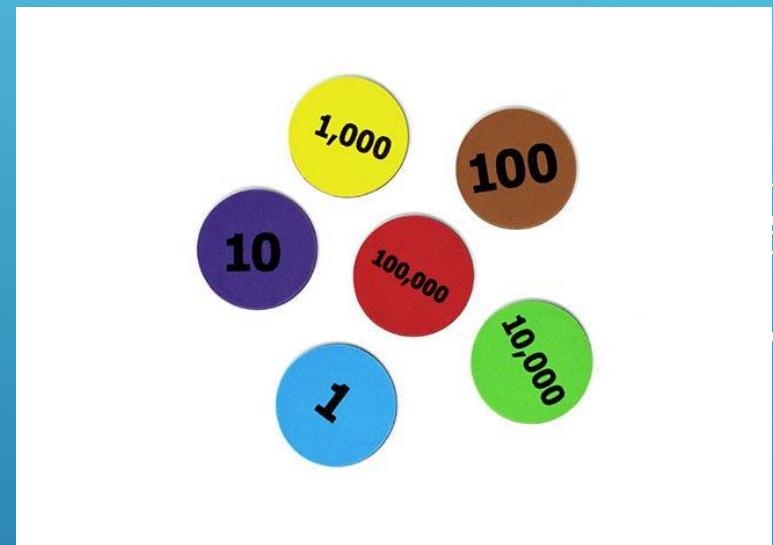
Place Value Counters

- Place Value Counters is one of the main manipulatives that we use in KS2.
- Children would already have an understanding of how to use this resources (addition and subtraction)

84 ÷ 2=

112 x 3=

This array shows:

9 columns of 5 rows

9 x 5 = 45 bananas

column

row
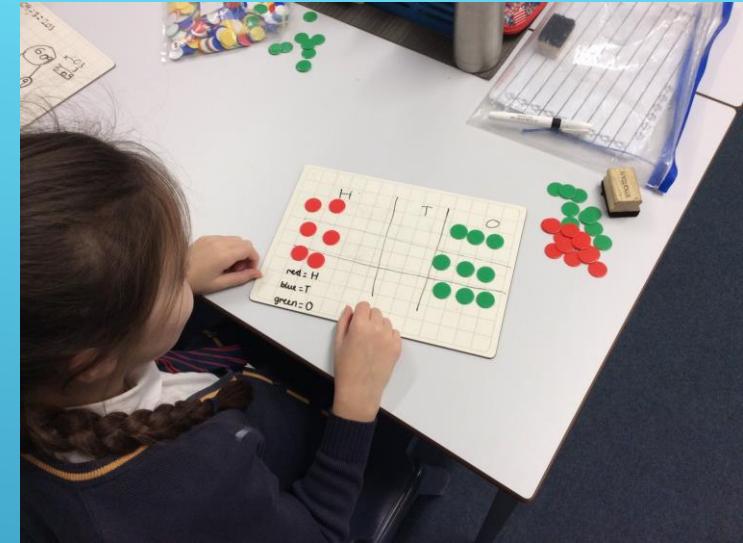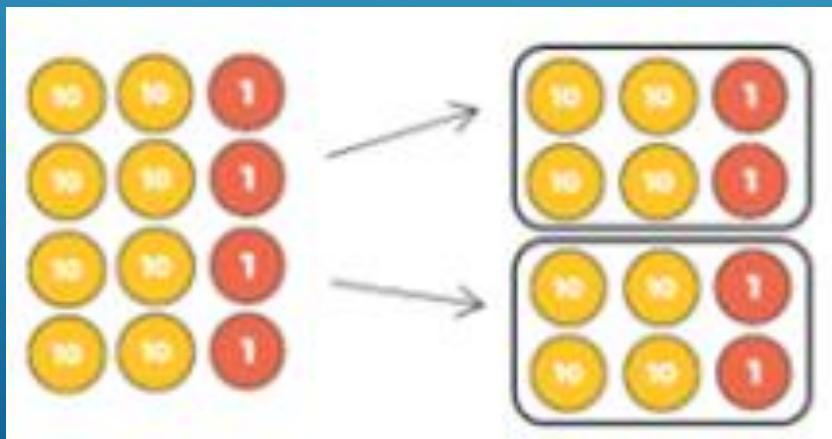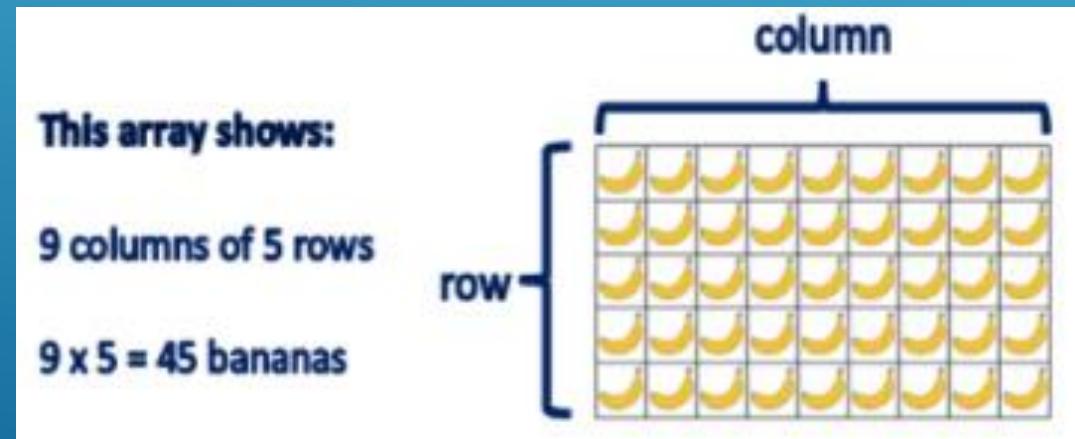
Key terminology used with Multiplication:

Definition of

Multiplicand

The number that gets multiplied.

But because we can multiply the two numbers in any order, it is better to use the word "factor".

Multiplication:

$$6 \times 3 = 18$$

Factor
(or Multiplier)

Factor
(or Multiplicand)

Product
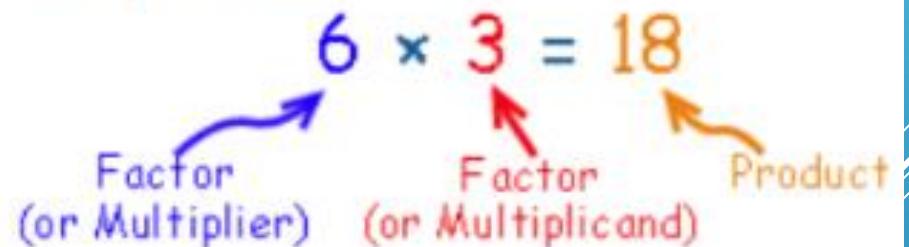
CONCRETE

Multiplication- 1 digit x 1 digit

4 x 2 =

Step 1: How many columns are there?
There are 4 columns

Step 2: How many rows are there?
There are 3 rows

Step 3: Write the total amount of objects.

CONCRETE

Multiplication- 1 digit x 1 digit

2 x 4 =

We will then model that if we turn it around, we can create another array with the same answer.
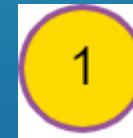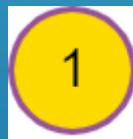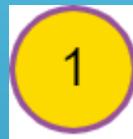
Key terminology used with division:

Division is ...

... splitting into equal parts or groups. It is the result of "fair sharing".

Division has its own special words to remember.

Let's take the simple question of **22 divided by 5**. The answer is **4**, with **2 left over**.

Here we see the important words:

$$\text{Dividend} \longrightarrow 22 \div 5 = 4 \text{ R } 2 \longleftarrow \text{Remainder}$$

Divisor ↗   ↖ Quotient

CONCRETE

Division – 2 digit ÷ 1 digit

33 ÷ 3 =

CONCRETE
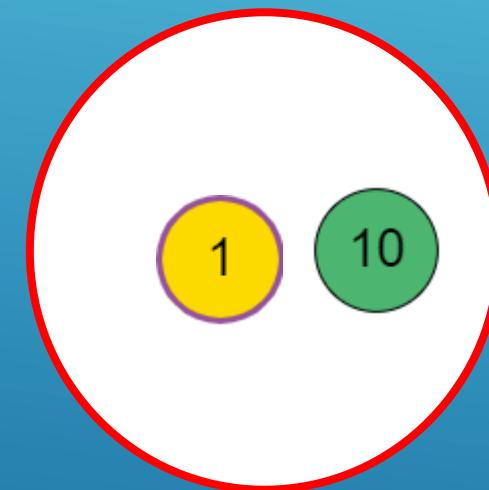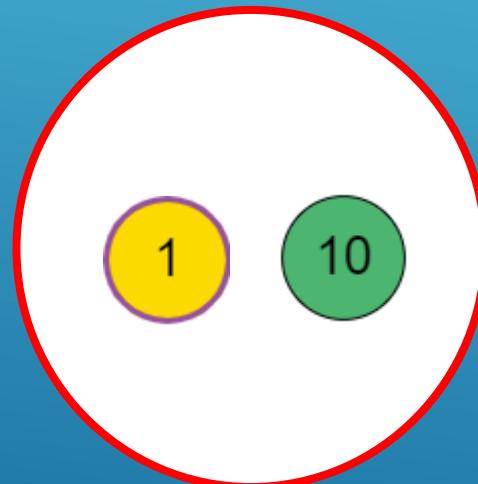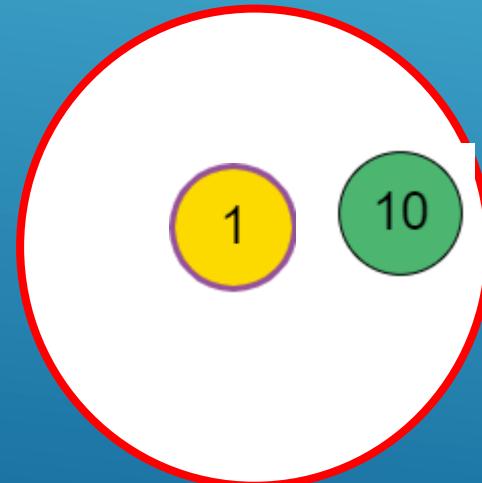
Division – 2 digit ÷ 1 digit

Tens		Ones	
10		1	
10		1	
10		1	
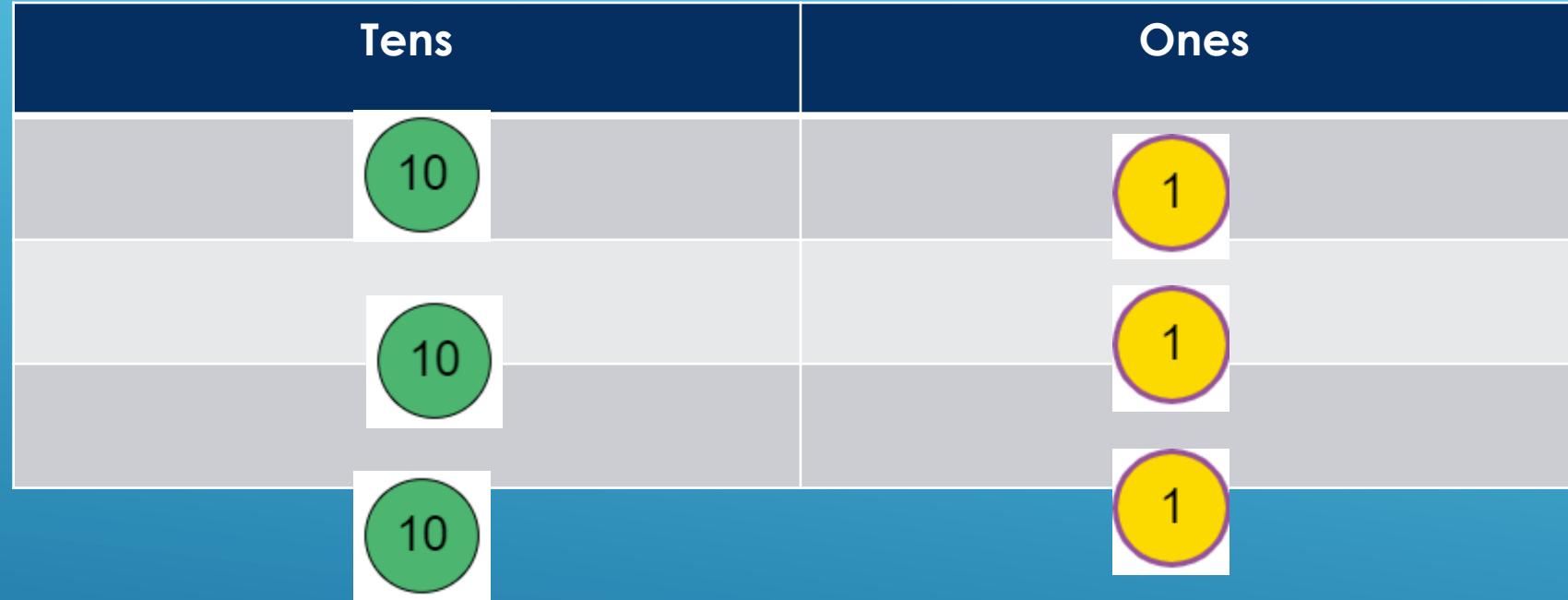
$$33 ÷ 3 =$$

To find the quotient, you count one of the groups (rows)

CONCRETE

Division – 2 digit ÷ 1 digit

34 ÷ 3 =

Tens		Ones	
10		1	
10		1	
10		1	

1

To find the quotient, you count one of the groups (rows)

PICTORIAL

➢ Once children have understood the concrete stage to multiplication and division they can move onto the pictorial stage.

➢ The pictorial stage requires the children to draw simple pictures to represent the numbers in the equation.

➢ In multiplication, we can also use a bar model (which helps them understand the link between multiplication and addition).

PICTORIAL

7 x 4 =

3 x 15 =

36 ÷ 3 =
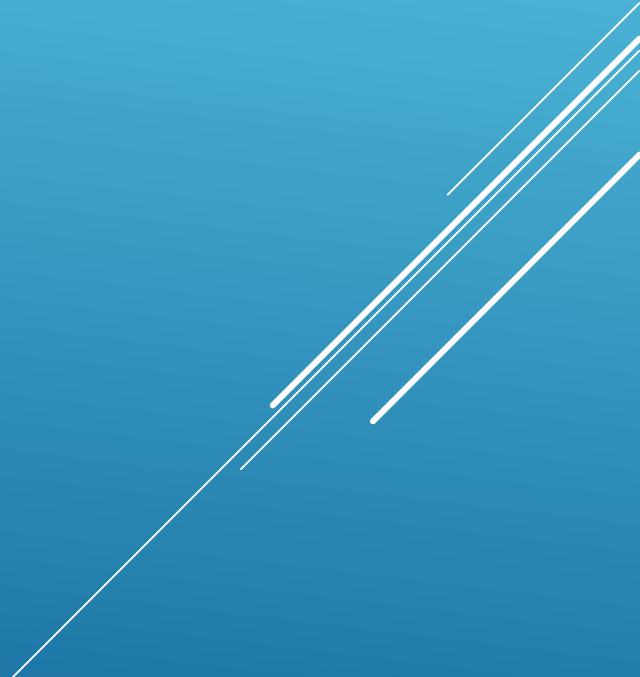
ABSTRACT

➢ 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 and bus stop method is another example of the abstract stage. This is something the children are introduced to in Year 3.

ABSTRACT

Short multiplication

342 x 4=

Short division

561 ÷ 3=

Long multiplication

423 x 34=

Long division

5629 ÷ 13=

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.

➤ Concrete resources, such as place value counters, 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 multiplication and division (lego blocks, counters, etc).

➤ Once children understand the concrete and pictorial representations of equations, you may wish to practice solving multiplication and division mentally through related known facts.

➤ Times Tables Rockstars develops children's times table knowledge which will support them when multiplying and dividing.

Place Value - Online Resource

https://mathsbot.com/manipulatives/placeValueCounters

ANY QUESTIONS?