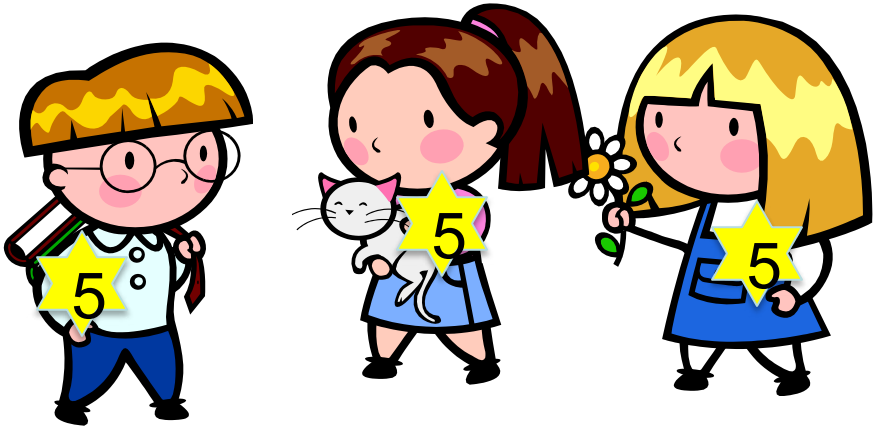
Progression in Calculations in KS1

Understanding and Using Calculations

For all calculations, children need to:

- Understand the = sign as **is the same as** .
- See calculations where the equals sign is in different positions, e.g. 3 + 2 = 5 and 5 = 7 - 2.
- Approximate before calculating and check whether their answer is reasonable.

There are **three** children in class **four** who are **five**.



Class 4

Addition – a definition

Children need to understand the concept of addition, that it is:

- **Combining two or more groups to give a total or sum**
- **Increasing an amount**

They also need to understand and work with certain principles:

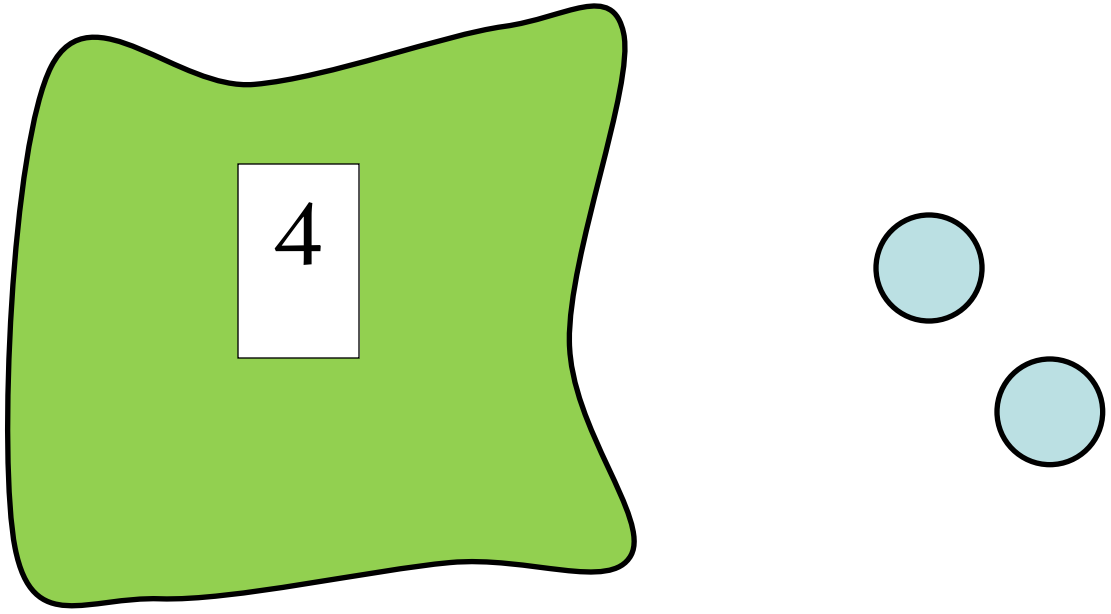
- **Inverse of subtraction**
- **Commutative i.e. 5 + 3 = 3 + 5**
- **Associative i.e. 5 + 3 + 7 = 5 + (3 + 7)**

Counting All

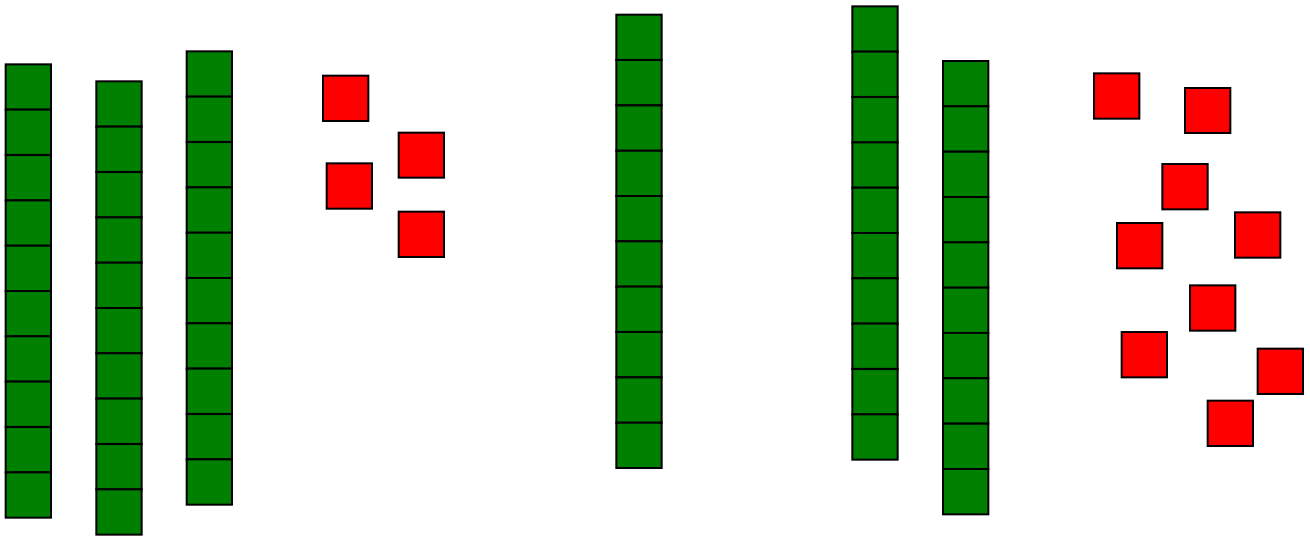
Using practical equipment to count out the correct amount for each number in the calculation and then combine them to find the total, e.g. 4 + 2

From Counting All to Counting On

To support children in moving from counting all to counting on, have two groups of objects but cover one so that it can not be counted, e.g. 4 + 2



Adding Two Digit Numbers

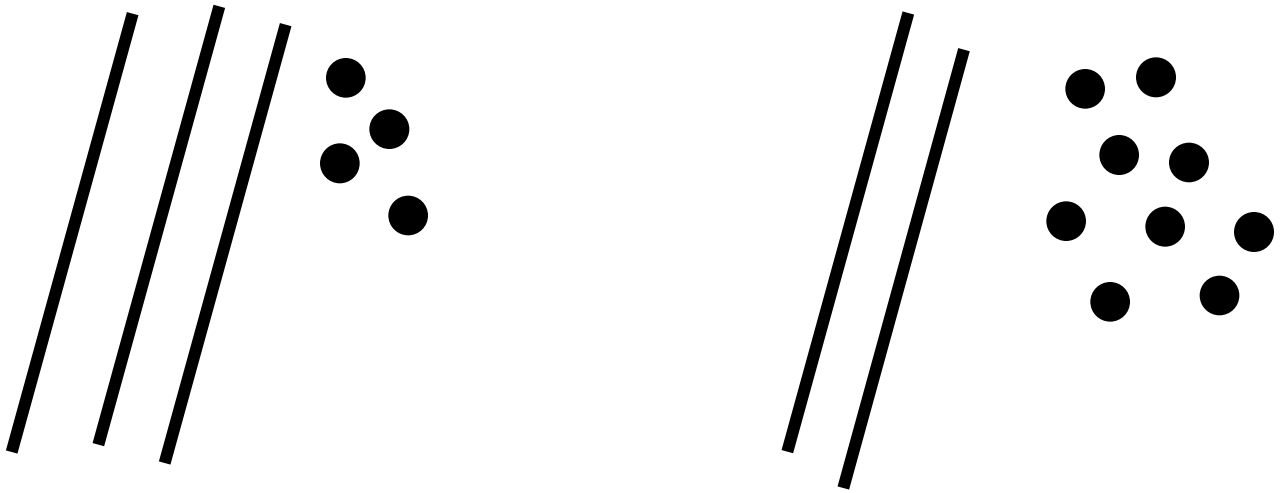


Adding two digit numbers - concrete

Children need to be able to count on in 1s and 10s from any number and be confident when crossing tens boundaries.

Adding Two Digit Numbers

Children can support their own calculations by using jottings, e.g. 34 + 29



Subtraction – a definition

Children need to understand the concept of subtraction, that it is:

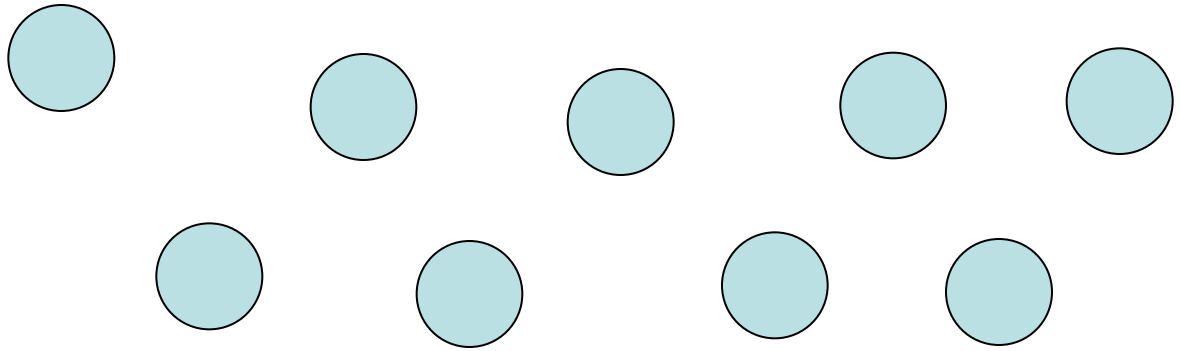
- **Removal of an amount from a larger group (take away)**
- **Comparison of two amounts (difference)**

They also need to understand and work with certain principles:

- **Inverse of addition**
- **Not commutative i.e. 5 - 3 ≠ 3 - 5**
- **Not associative i.e. (9 – 3) – 2 ≠ 9 – (3-2)**

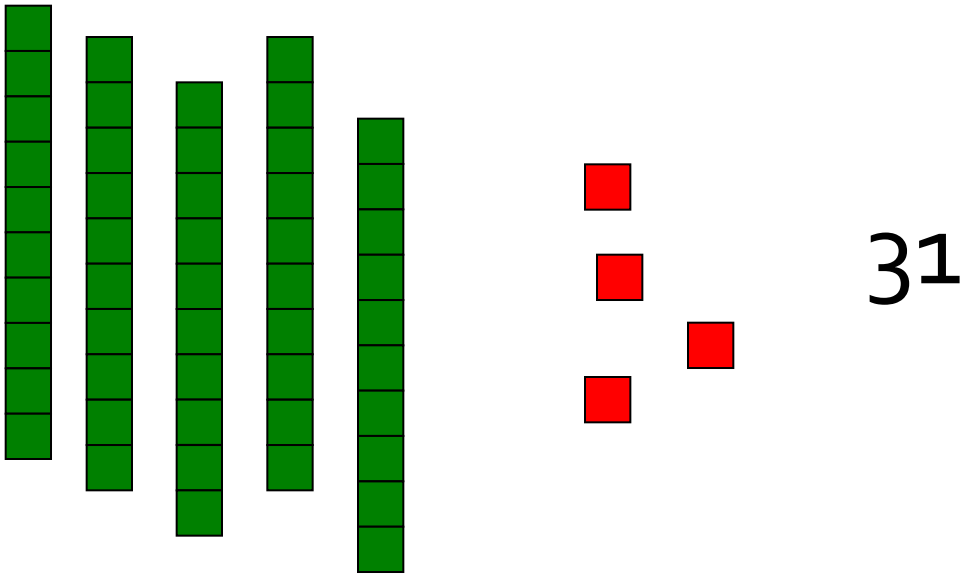
Taking Away

Using practical equipment to count out the first number and removing or taking away the second number to find the solution, e.g. 9 - 4



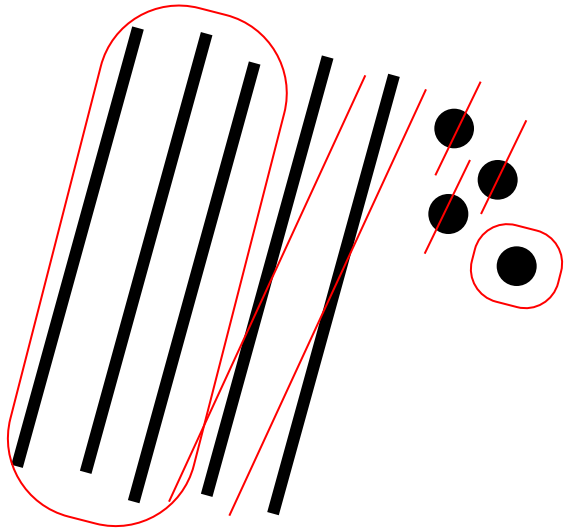
Taking Away Two Digit Numbers

Children can use base 10 equipment to support their subtraction strategies by basing them on counting, e.g. 54 - 23



Taking Away Two Digit Numbers

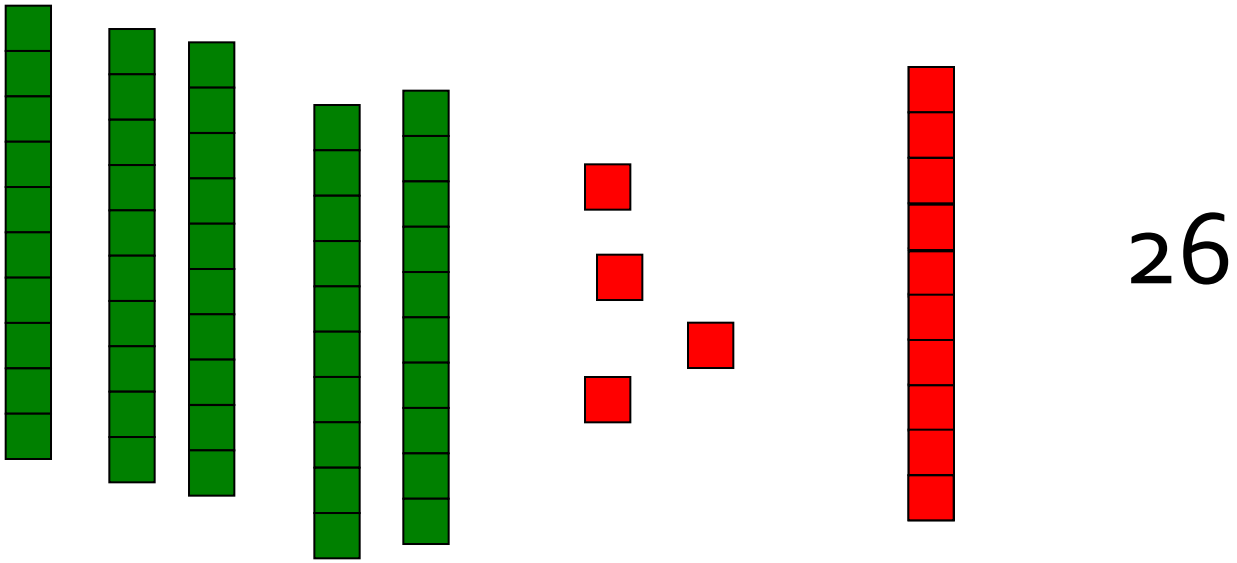
Children can support their own calculations by using jottings, e.g. 54 - 23



31

Taking Away Two Digit Numbers (Exchange)

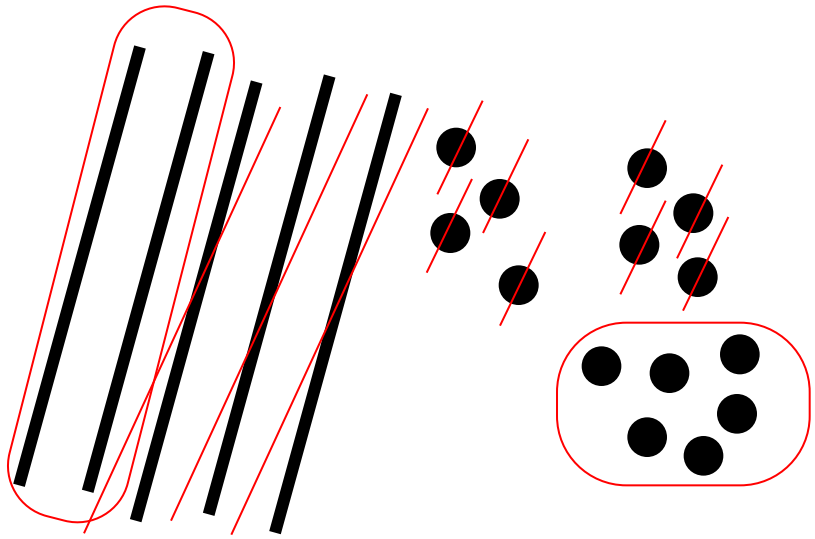
Children can use base 10 equipment to support their subtraction strategies by basing them on counting, e.g. 54 - 28



26

Taking Away Two Digit Numbers (Exchange)

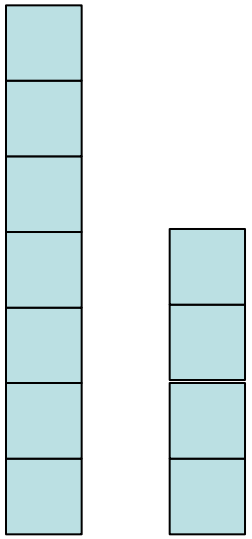
Children can support their own calculations by using jottings, e.g. 54 - 28



26

Finding the Difference (Counting Back)

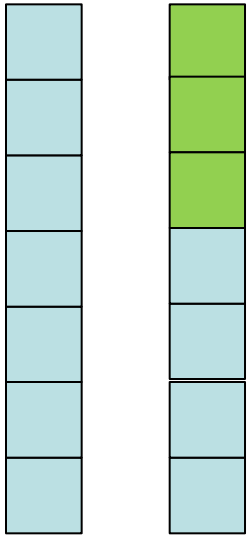
Children need to understand how counting back links to subtraction, e.g. 7 – 4
Make the large tower the same size as the small tower.



Finding the Difference (Counting On)

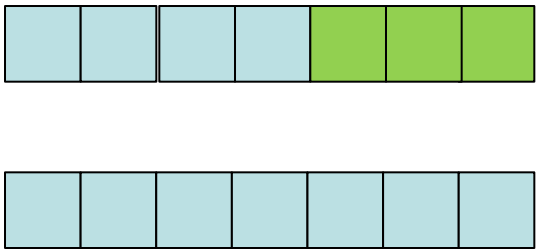
Children need to understand how counting on links to subtraction, e.g. 7 – 4

Make the small tower the same size as the large tower.



Finding the Difference (Counting On)

To begin linking to number lines, this can be looked at horizontally instead of vertically.



Multiplication

Children need to understand the concept of multiplication, that it is:

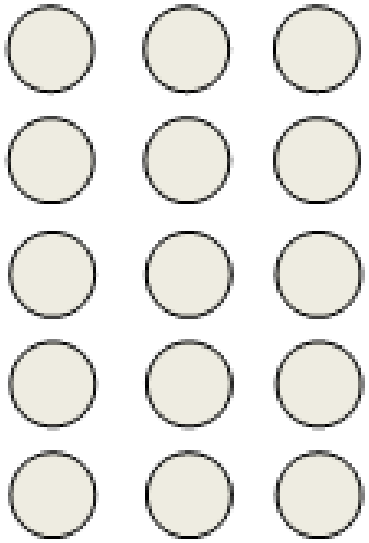
- **Repeated addition**
- **Is scaling**
- **Can be represented visually as an array**

They also need to understand and work with certain principles:

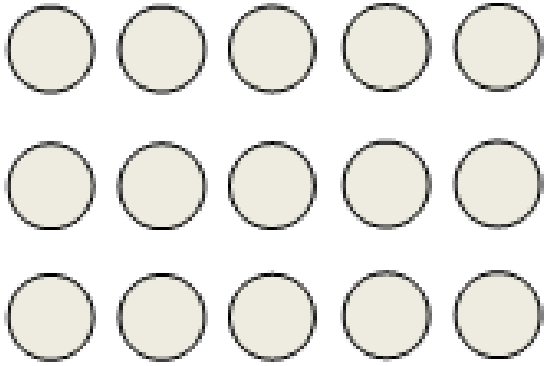
- **Inverse of division**
- **Is commutative i.e. 3 x 5 = 5 x 3**
- **Is distributive i.e. 23 x 4 = (20x 4) + (3 x 4)**
- **Is associative i.e. 2 x (3 x 5) = (2 x 3) x 5**

Use of Arrays

Children need to understand how arrays link to multiplication through repeated addition and be able to create their own arrays.



3 + 3 + 3 + 3 + 3 = 15

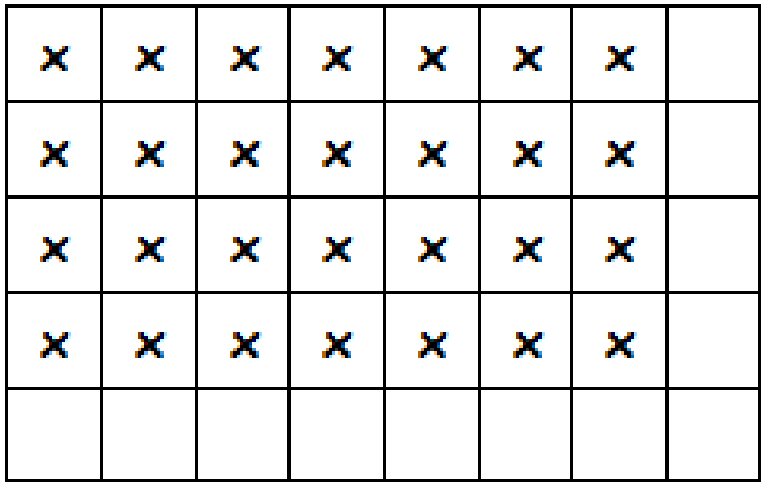


5 + 5 + 5 = 15

Continuation of Arrays

Creating arrays on squared paper (this also links to understanding area).

4 x 7 =



4 x 7 = 7 + 7 + 7 + 7 = 28

Division

Children need to understand the concept of division, that it is:

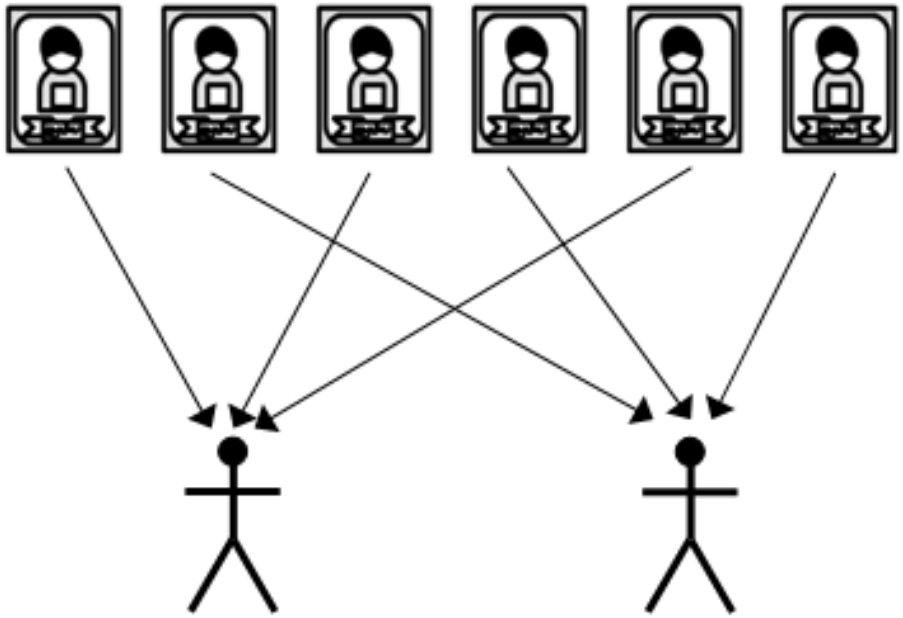
- **Repeated subtraction**

They also need to understand and work with certain principles:

- **Inverse of multiplication**
- **Is distributive i.e. $96 \div 6 = (60 \div 6) + (36 \div 6)$**
- **Is not commutative i.e. $15 \div 3 \neq 3 \div 15$**
- **Is not associative i.e. $30 \div (5 \div 2) \neq (30 \div 5) \div 2$**

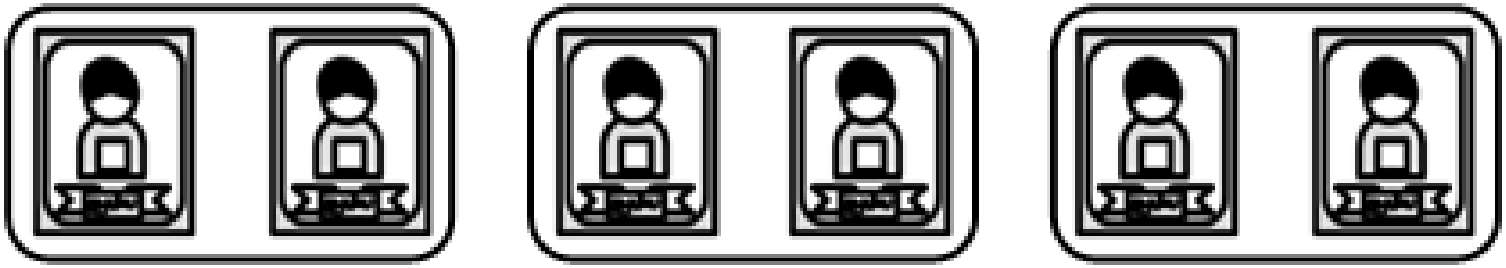
Division as Sharing

Children naturally start their learning of division as division by sharing, e.g. $6 \div 2$.



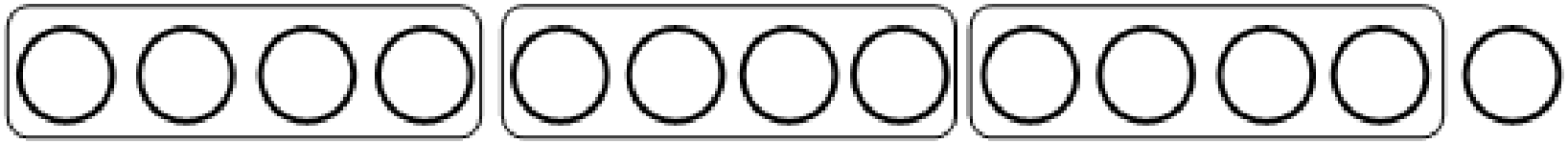
Division as Grouping

To become more efficient, children need to develop the understanding of division as grouping, e.g. 6 ÷ 2.



Division as Grouping

To continue their learning, children need to understand that division calculations sometimes have remainders, e.g. 13 ÷ 4.



They also need to develop their understanding of whether the remainder needs to be rounded up or down depending on the context.

Key Messages

- For written calculations it is essential that there is a progression which culminates in one method.
- The individual steps within the progression are important in scaffolding children's understanding and should not be rushed through.
- Practical equipment, models and images are crucial in supporting children's understanding.