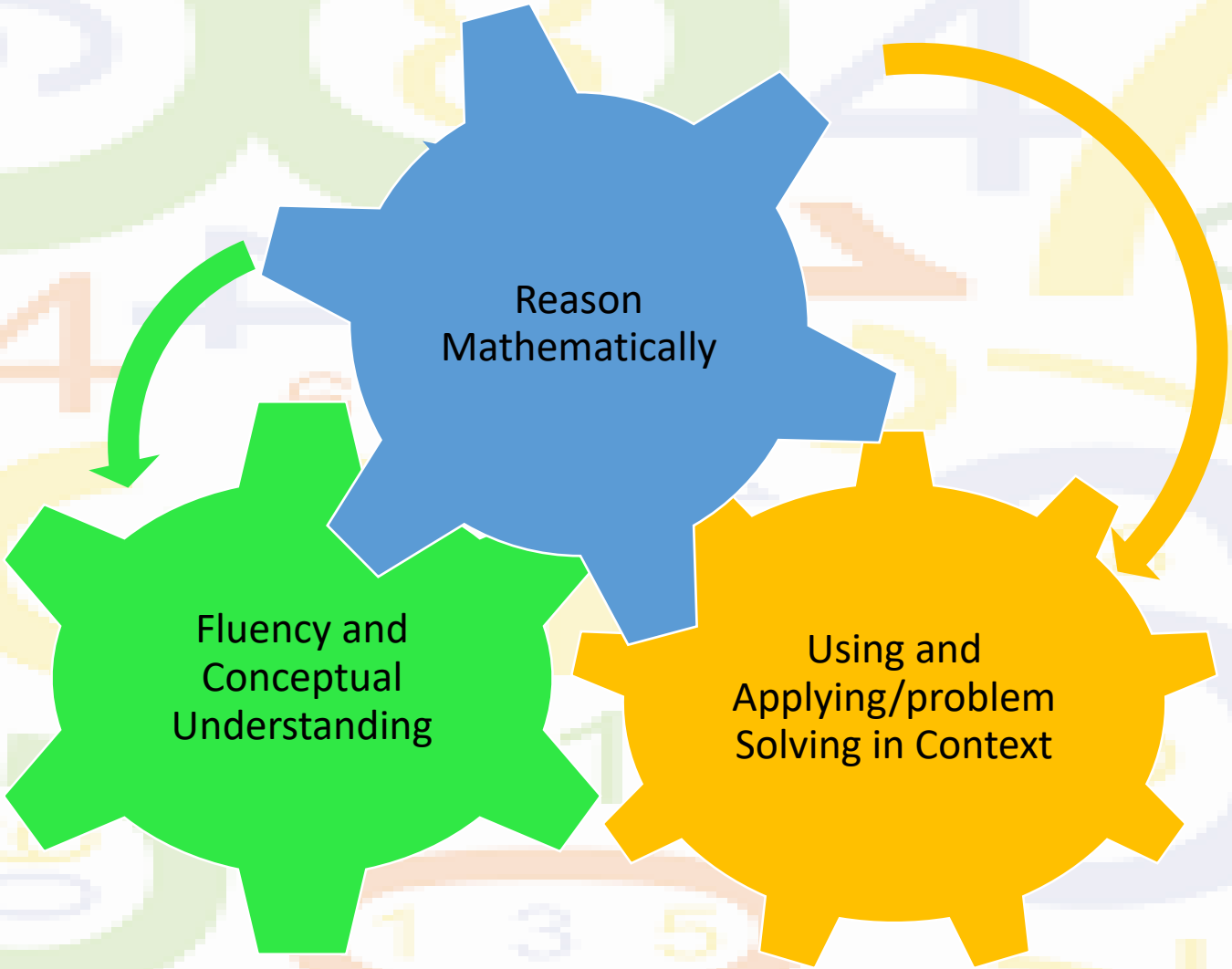
Mastery in Maths

Aims:

- To know what the Curriculum says about Maths
- To look at what Mastery means and what underpins it
- To know the CPA approach
- To use some manipulatives
- To do some maths!

Aims of the National Curriculum



Teaching for Mastery

- Access
- Pattern
- Making Connections

- Chains of Reasoning
- Making Connections

Coherence

Representation & Structure

Mathematical Thinking

Small connected steps are easier to take

Variation

Fluency

- Procedural
- Conceptual
- Making Connections

- Number Facts
- Table Facts
- Making Connections

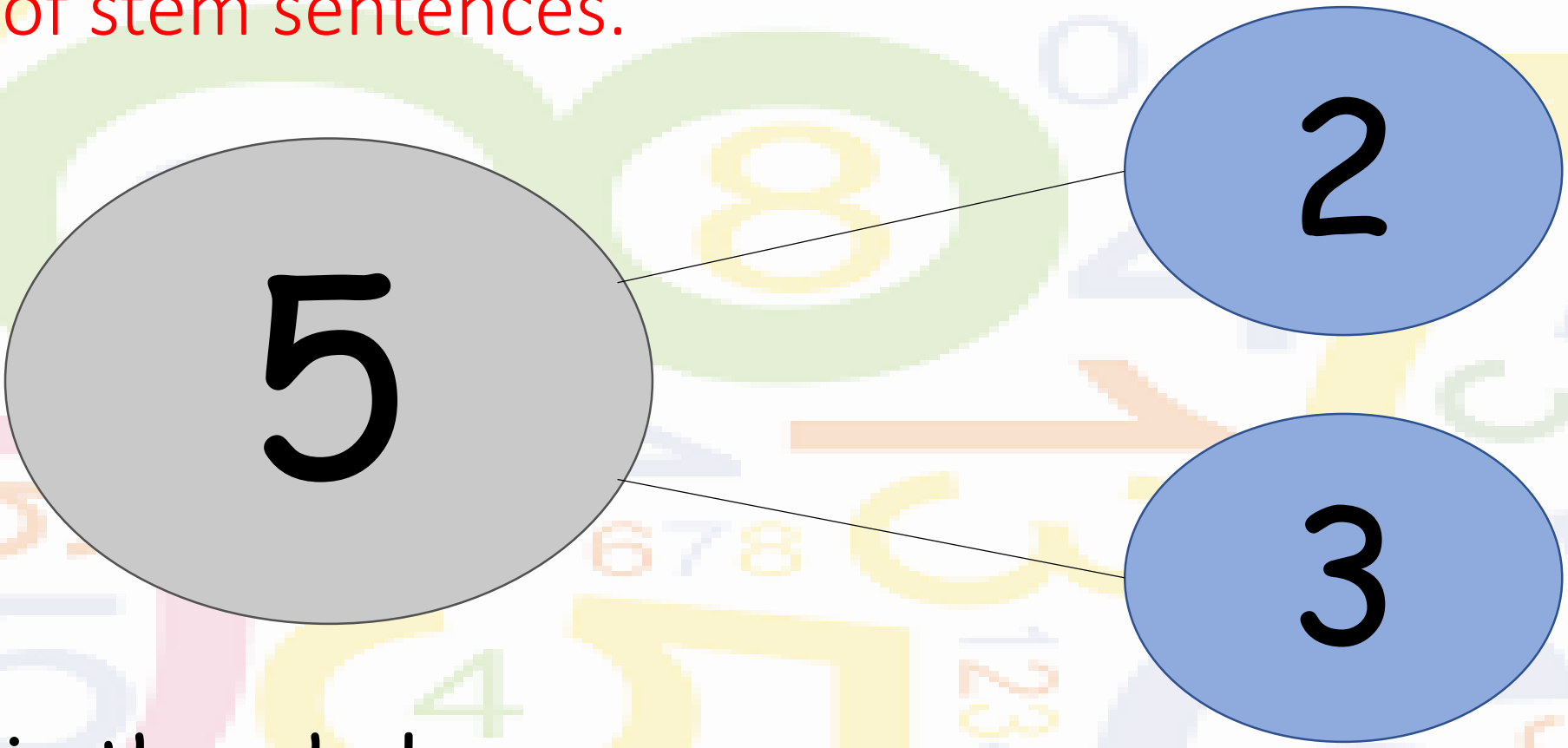
What the curriculum says

- The national curriculum for mathematics aims to ensure that all pupils:
- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **solve problems** by applying their mathematics to a variety of routine and non- routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Stem Sentences

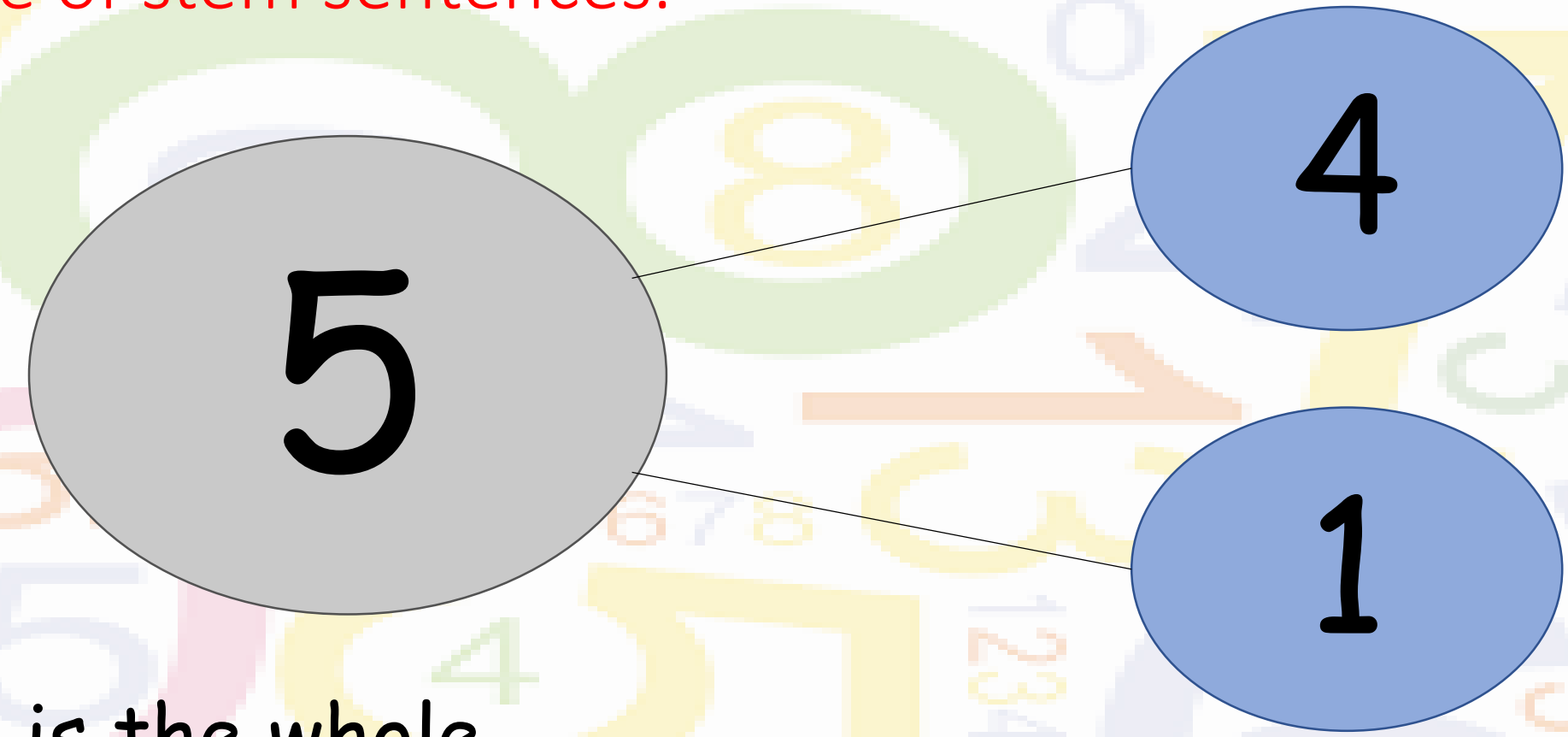
- **Sentence Stems**. This technique gives students the opportunity to respond in the form of a complete **sentence** to effectively communicate. **Sentence stems** provide scaffolding to help students get started in speaking or writing without the added pressure of thinking about how to correctly formulate a response

Use of stem sentences.



5 is the whole.
2 is a part.
3 is a part.

Use of stem sentences.



5 is the whole.
4 is a part.
1 is a part.

What does it mean to master?

What do we mean by Mastery?

- ***A mastery approach**: a set of principles and beliefs. This includes a belief that all pupils are capable of understanding and doing mathematics, given sufficient time. Pupils are neither 'born with the maths gene' nor 'just no good at maths'. With good teaching, appropriate resources, effort and a 'can do' attitude all children can achieve in and enjoy mathematics.*

NCETM

Signature Bake - Fluency

- I know how to do it (operations and their relationships)
- It becomes automatic and I don't need to think about it – to make a cake I need to add flour, eggs, sugar and butter (mental arithmetic)
- I'm really good at doing it (speed)
- I can show someone else how to do it (understanding)

Variation in Fluency

- 5 + 1 =
- 15 + 2 =
- 22 + 63 =

- 5 + ? = 6
- ? + 2 = 17
- ? = 22 + 63
- 20 ÷ ? = 5

Technical Challenge - Reasoning

- Deep and sustainable learning
- The ability to build on something that has already been sufficiently mastered
- The ability to reason about a concept and make connections
- Conceptual understanding (comprehension of mathematical concepts, operations and relations) and procedural fluency (ability to formulate, represent and solve mathematical problems.

*"Reasoning is the "**glue**" that helps mathematics make sense."*

How do we help children to communicate their reasoning?

I am going to count to 20.

I start at 8.
Will I say 11?
Convince me.

Spot the mistake:

19, 18, 16, 15, 14
What is wrong with this sequence of numbers?

I count backwards from 20
How many steps does it take me to get to 7?

- I think this because
- If this is true then
- I know that the next one is….. because
- This can't work because
- When I tried….I noticed that
- The pattern looks like
- All the numbers begin with

Show Stopper – Problem Solving

- Sophie went to the shop and brought 5 bananas and 6 apples. How many pieces of fruit did she buy altogether?

$$5 + 6 = ?$$

- Altogether Sophie and Ethan have 13 apples. Sophie has 6 apples. How many has Ethan got?

$$6 + ? = 13$$

- Sophie and Ethan have 20 apples. They both have an even amount each? How many could they have?

$$? + ? = 20$$

11

$20 + \square = 70$

1 mark

5

$\square = 15 - 2$

28 There are **55** cakes.

20 boys and **19** girls each take a cake.

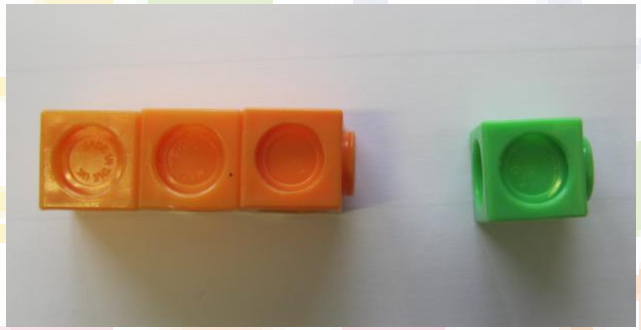
How many cakes are **left**?

Show your working

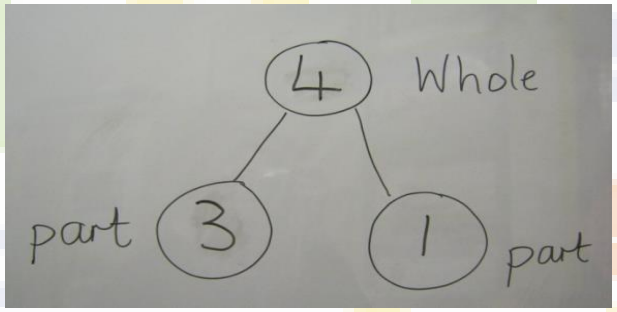
cakes

So…what strategies and manipulatives help children achieve mastery?

Concrete



Pictorial



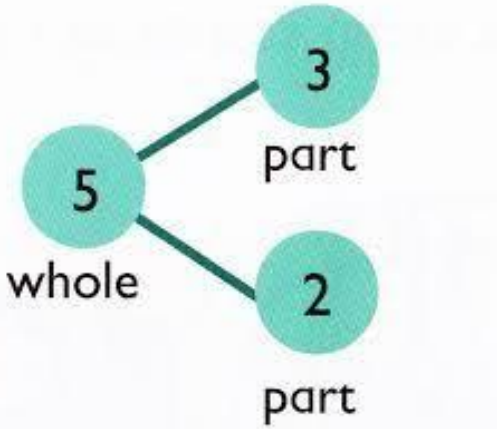
Abstract

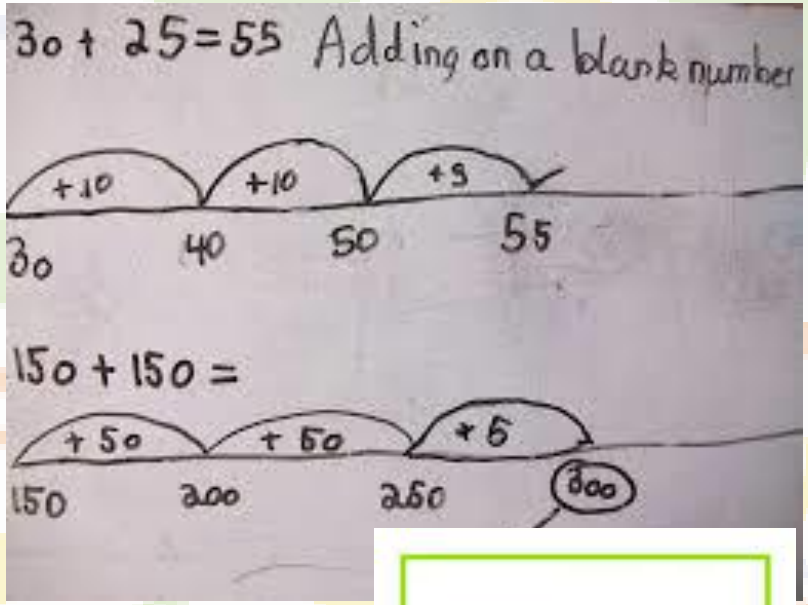
3 + 1 = 4

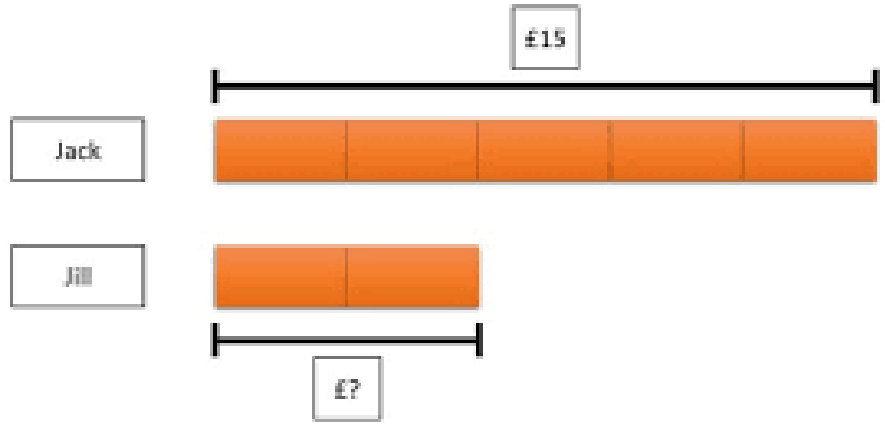
Concrete or pictorial representations support children to understand abstract concepts and deepen understanding.

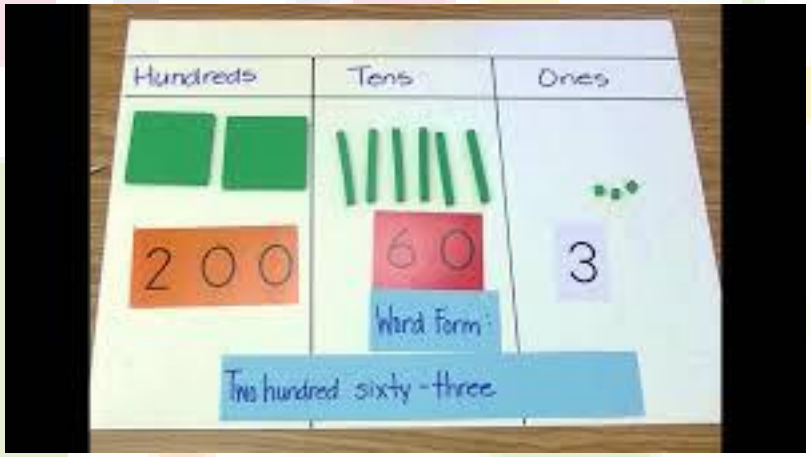
Manipulatives

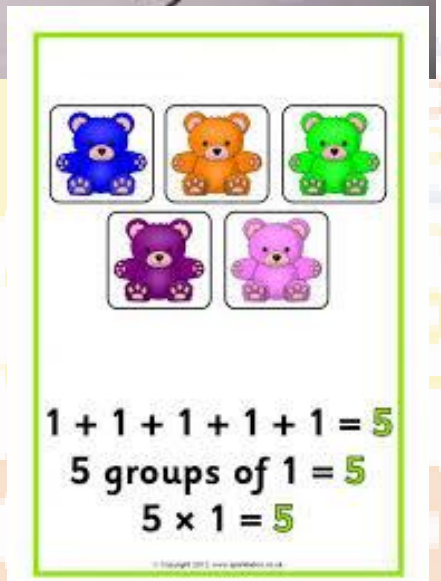
Pictorial Representations

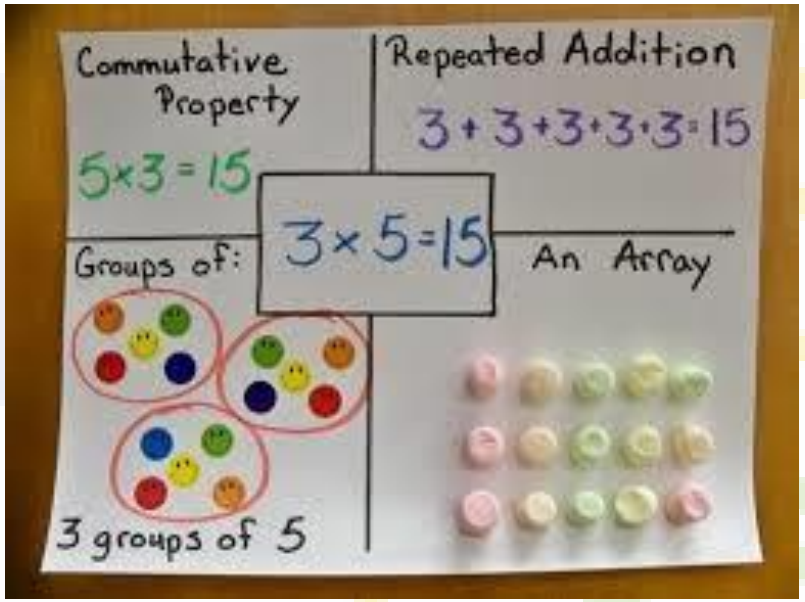












Abstract

$4 + 7 + 6 = \boxed{10} + \boxed{7}$

10

$= \boxed{17}$

$10 = 6 + 4$

$10 - 6 = 4$

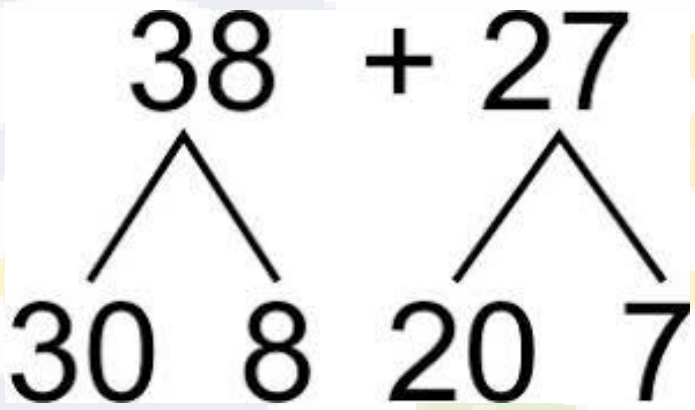
$10 - 4 = 6$

$10 = 4 + 6$

5 + 12 = 17

Place the larger number in your head and count on the smaller number to find your answer.

Divide 28 into 7 groups. How many are in each group?



Workshops

- EYFS/KS1 in Acorn Class
- KS2 in Maple Class
- We will run the workshops twice for those who would like to come to both.