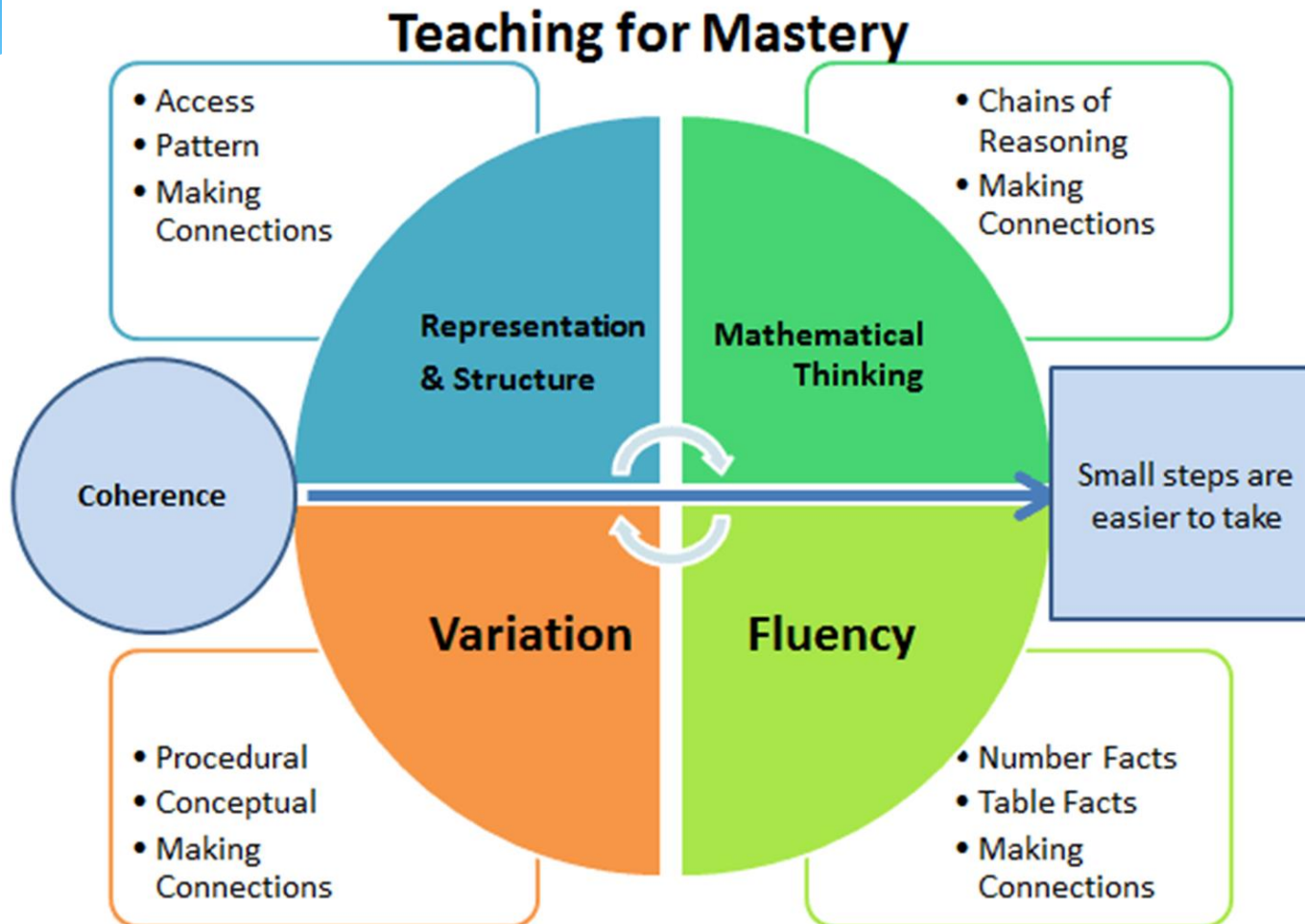# Maths In KS2 at Rainbow Forge

The National Curriculum

- fosters mathematical understanding of new concepts and methods, including teachers' explanations and the way they require pupils to **think and reason mathematically for themselves**

- ensures that pupils acquire mathematical knowledge appropriate to their age and starting points, and enables them to **recall it rapidly and apply it fluently and accurately**,

- uses **resources and approaches to enable pupils in the class to understand and master** the mathematics they are learning. The national curriculum for mathematics specifies the aims and then states, **'The expectation is that the majority of pupils will move through the programmes of study at the same pace.**

- develops depth of understanding and readiness for the next stage. **Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content.** Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.'

- enables pupils to solve a variety of mathematical problems, **applying the mathematical knowledge and skills** they have been taught.

Mastering Maths

What does "mastery" mean?

- I know how to do it.
- It becomes automatic and I don't need to think about it.
- I do it confidently.
- I do it well. (Does "well" mean "quickly"? Sometimes but not always)
- I can do it in a new way, or in a new situation.
- I can now do it better than I used to.
- I can show someone else how to do it.
- I can explain to someone else how to do it.

But how?

Teaching for Mastery

- Access
- Pattern
- Making Connections

- Chains of Reasoning
- Making Connections

Representation & Structure

Mathematical Thinking

Coherence

Small steps are easier to take

Variation

Fluency

- Procedural
- Conceptual
- Making Connections

- Number Facts
- Table Facts
- Making Connections

There are 5 key principles behind Teaching for Mastery. Each of these principles work together in all lessons to make sure that children become confident in their skills and can see how each concept links together.

Fluency involves:

- Quick recall of facts and procedures
- The flexibility and fluidity to move between different contexts and representations of mathematics.
- The ability to recognise relationships and make connections in mathematics
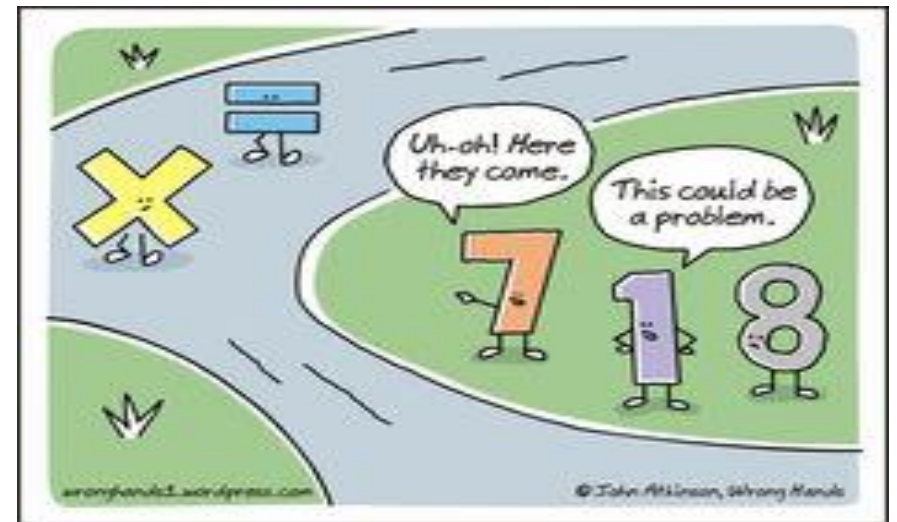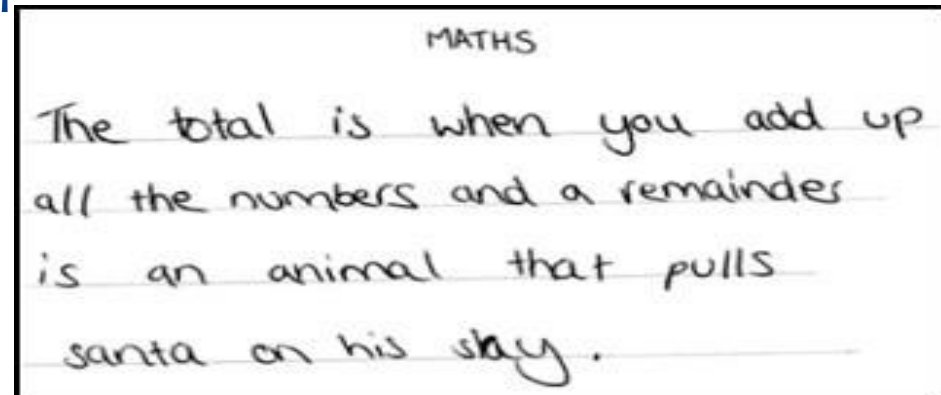
Mathematical Thinking

It is central to mathematics learning; the glue that both develops and holds mathematics learning together

It involves:

* Looking for pattern and relationships
* Logical Reasoning
* Making Connections

MATHS

The total is when you add up all the numbers and a remainder is an animal that pulls santa on his shay.

Features of a lesson

* Whole class work together – mixed ability pairs
* Adaptation through concrete and pictorial methods
* Journey taken – small steps
* Ping-pong teaching
* Accurate use of mathematical knowledge language
* Repetition (of each other and of the teacher)
* Build on each other's ideas (differentiation by questioning)
* Longer units which build on each other
* An expectation that all children can achieve
* Depth vs Acceleration – children do not move on; they explain, apply and reason

CONCRETE
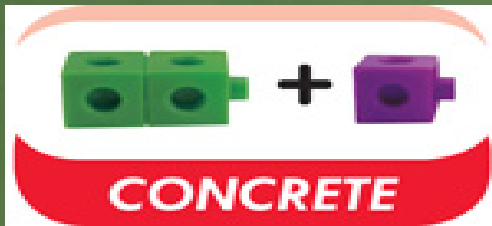
Concepts are introduced through hands-on experiences with manipulatives.

PICTORIAL

Students visualise the concept and it is represented through models like number bonds and bar models.
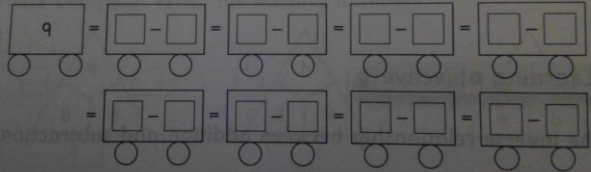
ABSTRACT

2 + 1 = 3
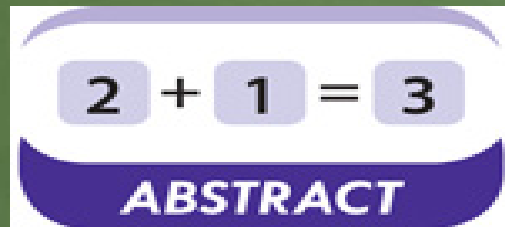
Students use abstract numbers and symbols alongside the context in order to understand what they mean.

Many different ways

Write subtraction sentences with the difference of 9.

6 + 8 = 14

Find 3 different ways to solve this.

[Where relevant, would expect systematic working from highest attainers]

Generalising

Captain Conjecture says, 'All of these shapes are rectangles because they have four sides.'
Do you agree?

D   E   F

Explain your reasoning.

Children should appreciate that a square is a rectangle because it has 4 right angles and opposite sides are of equal length.

Captain Conjecture says, 'I can double any number, but I can only halve some numbers.'

Do you agree?

Explain your reasoning.

Equivalent or not?

Sam has written some different ways to describe the picture. Tick or cross to show if he is right or wrong. Where he is wrong, write a correct expression:

(30 x 0.1) + (1 x 0.1)   0.3 + 1

3 − 0.1 $\frac{31}{10}$

$\frac{40}{10} - \frac{9}{10}$ 1 + 0.1 + 2

Which of these facts are true? Write T (true) or F (false) against each.

3 x 10 = 10 + 10 + 10   3 x 10 = (2 x 10) + 10

3 x 10 = 10 x 3   3 x 10 = (10 x 10) − (7 x 10)

3 x 10 = 3+3+3+3+3+3+3+3+3+3

Differentiating through depth for highest attainers – some ideas!*

Explaining ideas/ misconceptions

Jack says that the two times table is the same as doubles. Complete the following:

Jack is partly right in that...   Jack is partly wrong in that...

The number sentence for this picture is £4 x £10 = £40   Explain why Tom is wrong.

Empty box problems

How many different ways can you find to solve this?

☐ ☐ ☐ x
☐ 0
5, ☐ ☐ ☐

$3\frac{1}{4}$
$2\frac{1}{2}$ — $1\frac{1}{2}$ — ○ — $\frac{3}{4}$ — ○
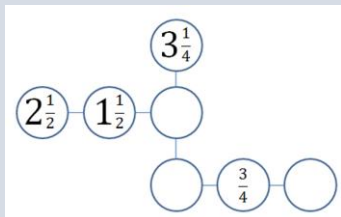
Here is part of a multiplication grid. Fill in all the missing numbers.

×		
	12	24
		12
	21	

These are not the only ways!
Just some of our 'go to' ones

No clear signpost

Mark another fraction on this line.
And another, and another.

0 ———————— $\frac{3}{4}$ ————

Here is a tiled floor pattern.
It is made from equilateral triangles, squares and a regular hexagon

Work out the perimeter of the design.
Give your answer in metres.

600 mm
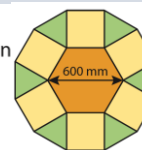
[A bit harder to write – start by using e.gs in NCETM assessing for mastery materials]

What is the same, what is different?

Write $\frac{17}{4}$ as a mixed number

Calculate 17 ÷ 4

What is the same, what is different?

What's the same and what's different about these shapes?

Which could be the odd one out and why?
Could each one be the odd one out?

But what is the impact?

Coherent progressive journey – within lesson / through school

Children's ownership of the learning

Resilience, confidence/ stickability

Staff subject knowledge and confidence

IMPACT

Change of attitude and aspiration

Increased and accurate use of mathematical language

Reasoning ability

Enthusiastic children

Fluency

Marking, feedback, support, challenge