Parent Workshop
Fluency in Maths across key stages

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PATANA

True or false?

- Memorising timestables is like learning to ride a bike, once you have learnt them, you will always have this skill.
- Manipulatives are mainly beneficial for younger students.
- Maths requires just as much talk and discussion as Literacy lessons or other subjects.
- If a parent is 'bad' at maths, their child will also be 'bad' at maths.

- Memorising timestables is like learning to ride a bike, once you have learnt them, you will always have this skill.

False - it is imperative that students continue to practise timestables and other key number facts (e.g number bond 2+8 = 10 therefore 20+80 = 100)
Learning these key facts and being able to recall them quickly and easily will reduce working load when learning which in turn helps students to retain more new learning.

- Maths equipment (apparatus) is mainly beneficial for younger students.

False. Maths equipment is used even for the older students in the school. We can use the equipment to develop a greater understanding of mathematical concepts as well as for developing a higher level of oracy when explaining these concepts.

- Maths requires just as much talk and discussion as Literacy or other subjects.

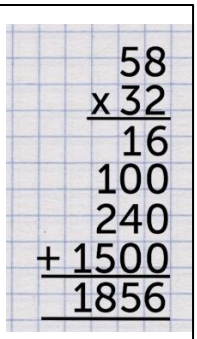
True. Talk is essential for learning math. Students should learn to explain their thought processes, describe patterns, give definition and discuss different ways to approach a question. This provides a greater depth of learning.

- If a parent is 'bad' at maths, their child will also be 'bad' at math.

False. However, children's perceptions of their abilities has a huge impact on their learning in maths. Students need to feel successful and build upon existing knowledge and skills steadily. *Some* Students might need extra support for maths, just like for any other subject, but all Students can be successful. Everyone learns at different rates and that is okay.

What is fluency in mathematics?

- **Efficiency** - an efficient strategy is one that the student can carry out easily, keeping track of what they are doing and feeling confident in the steps they are taking.



- **Accuracy** includes careful recording, knowledge of number facts and other important number relationships, and double-checking results.

- **Flexibility** requires the knowledge of more than one approach to solving a particular kind of problem. Students should be able to use more than one method to solve a problem.

30 x 50 = 1,500

Fluency is often used to refer to learning languages. To be fluent in a language is to be able to speak easily, confidently with minimal errors. This is similar to fluency in maths but not exactly the same. Fluency in maths is also based on flexibility. Can students use known mathematical processes and concepts in a flexible way.

30 x 50 = 1,500 used an an example of the three aspects of fluency. This is a Upper KS2 example.

- Students should be able to efficiently find the answer using multiplication facts. They should not be using a formal written method for this calculation but instead using known number facts (3 x 5 = 15). They then need to use their knowledge of place value to adjust the answer by multiplying by 10 and 10 again to get 100. Being efficient is being able to choose a method which would be efficient.
- Fluency facts need to be accurate to calculate this. It would not work if students thought that 3 x 5 is 18. Or is they only multiplied the 15 by 10 at the end.
- A key aspect of fluency is flexibility. If this were 30 x ? = 1,500 students should be able to use the previous skills to adapt and be flexible. What is the question were 30 x 49 = ? How about if this was a question about the area of a football pitch?

Fluency is not simply memorising facts. Yes, students need to recall times tables but they also need to understanding what they are learning. Without the understanding they won't be able to have flexibility. Fluency is being able to be accurate and efficient but also still be flexible and use these skills in a variety of contexts.

What do students need to be fluent in?

Counting

Timestables

Properties of number

Units of measure (length, weight, capacity)

Addition and subtraction facts (8 + 2 = 10)

Time

Estimating

What students need to be fluent in is age and stage dependent. E.g. Counting refers to counting objects, counting forwards and backwards, counting in steps of 2, 5 10, counting with larger numbers into the millions, counting across tens, hundreds, thousand boundaries (500 - 2 =)

Foundation - seeing and naming shapes in the world around them, counting objects in real life

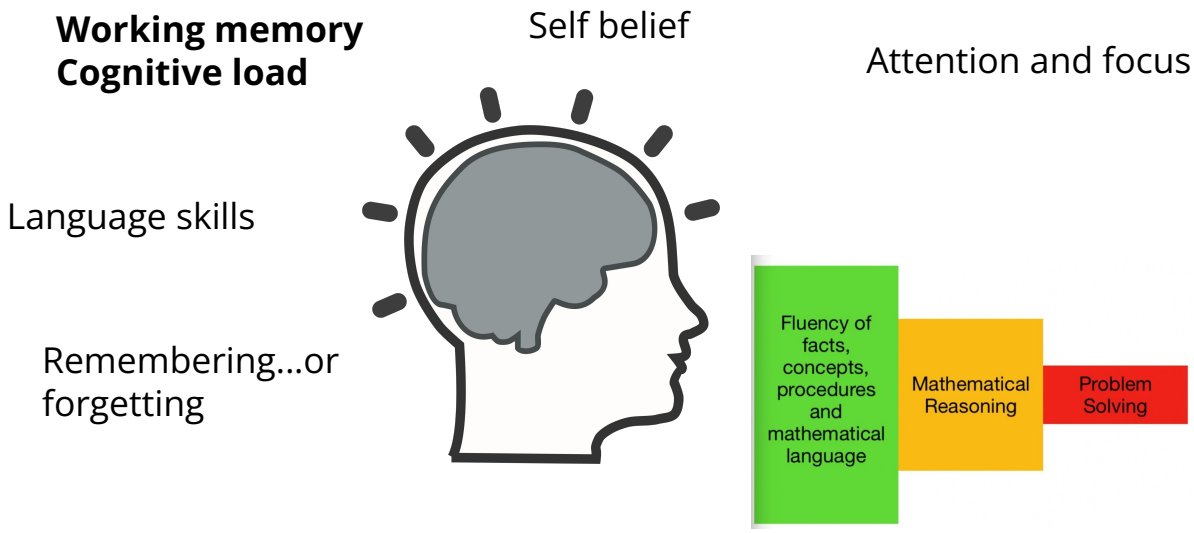
KS1 - fluency with whole numbers, counting and place value, number bonds, 2, 5 and 10 times tables.

KS2 - use of fractions as well as whole numbers, rounding and estimating before calculating, related addition and subtraction facts (e.g. 13 + 7 is 20 therefore 130 + 70 is 200 and 200 - 70 is 130), methods of calculation for addition, subtraction, multiplication and division.

Properties of number include knowing about prime numbers, factors and multiples, square numbers and cube numbers, odds and evens

The more students are fluent in these aspects of maths, the easier they will find new learning, and the more flexibility they will have with seeing calculation in unfamiliar contexts.

Learning is complicated: why fluency is important



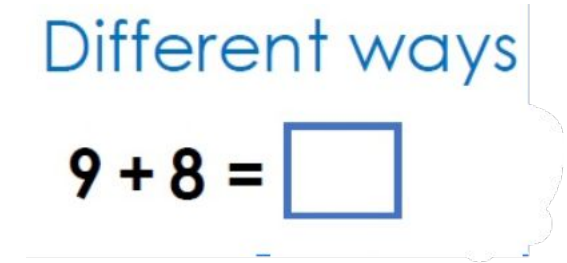
Learning is a complicated process. Providing students with the right structures and enviornment for learning and make a huge difference on their progress.

Learning is the process of information/ skills moving from working/ short term memory to long term memory. At each point of the learning process information can be lost/forgotten. The goal is for learning to get to, and stay, in long term memory.

- Students need to be paying attention to what they are learning (this links to their attitude to maths, feeling confident and enjoying maths will help students to give more attention)
- Working memory needs to be 'freed up'. Knowing key number facts/times tables reduces the load on working memory, scaffolds can also help with this (e.g. help sheets with key information displayed)
- Content needs to be revised so that it does not become forgotten and leave long term memory

The more parents can focus on the skills of fluency at home, the more time there is in the school day to focus on reasoning and problem solving

What skills do students need to be fluent in to access this reasoning activity?



Counting

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Units of measure (length, weight, capacity)

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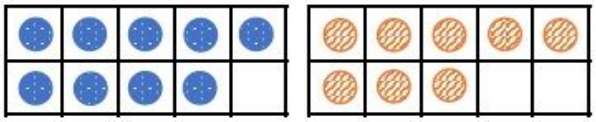
Time

Rounding and estimating



When we start new concept we use small numbers - this is so we can focus on the reasoning and language before moving onto larger numbers.

Skills needed: counting forward and back, adding and subtracting single digits, flexibility of subtracting different amount, understanding of place value (tens and ones), holding many pieces of information at one time, doubling and taking away/adding one. Estimating, this must be less than 20.

What skills do students need to be fluent in to access this problem solving activity?

James is using the following digit cards to complete a multiplication calculation.

1	2	2	4

He uses three of the digits in this calculation:

$$\begin{array}{r} 1,\square\square 1 \\ \times \quad\quad 2\square \\ \hline \end{array}$$

James wants to find calculations which have answers between 20,000 and 30,000.

Find two calculations he could use.

Counting

Timestables

Properties of number

Units of measure (length, weight, capacity)

Addition and subtraction facts

Time

Rounding and estimating

Skills needed: timetables, rounding and estimating, holding many pieces of information (either written or mental) at one time, knowledge of when multiplication will result in a regrouping (e.g. 2 x 6 = 12 which would need to be regrouped into one 10 and one 2), finding additional solutions

A good example of why developing fluency can be beneficial due to freeing up space in working memory. Often students have to hold many pieces of information in their minds at one time and being fluent in the key skills reduces the impact of this.

Talking helps to build fluency and leads to reasoning and problem solving

Number talks are:

Short

A problem with multiple solutions

Solved mentally (no jottings!)

A visual with multiple solutions

Based on open questions

The focus is on exploring different strategies

Number talks are a short activity based on an image (or real life situation) with questions that have multiple solutions. The focus is on strategies and talk rather than one answer.

Because it's solved mentally and the answers are shared in a conversational way, it challenges student's oracy- their ability to express their ideas fluently, concisely and grammatically accurately in speech. Without reference to written workings out. Used to developed oracy in maths and developing of specific mathematical vocabulary.

How many ways can you count the donuts?

Key vocabulary to use

Array
Multiply
Multiples
Groups of
Repeated addition
Commutative
Add
Square number
Rows of

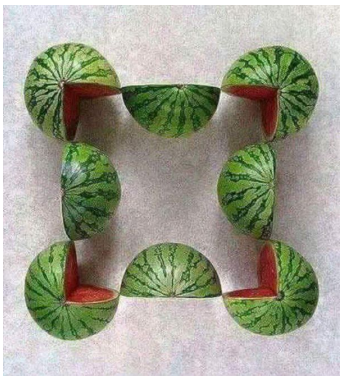
Try to ask open ended questions.
How many donuts are there? This is too closed.
How could you count the donuts? More open but doesn't encourage multiple solutions
How many ways can you count the melons? Encourages multiple solutions.
Or if in doubt 'what can you see'?

You can always follow up with the question 'how do you know that?

We often ask students to 'say it again better'. This doesn't need to be said in a horrible way, but instead you can ask your children to 'Say that again but this time use the word 'array'. This helps to develop precise mathematical vocabulary.

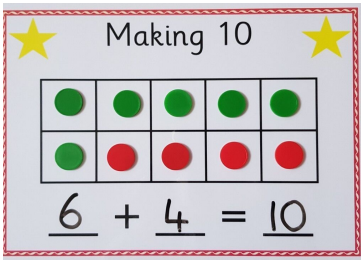
Opportunities for maths talks are everywhere!

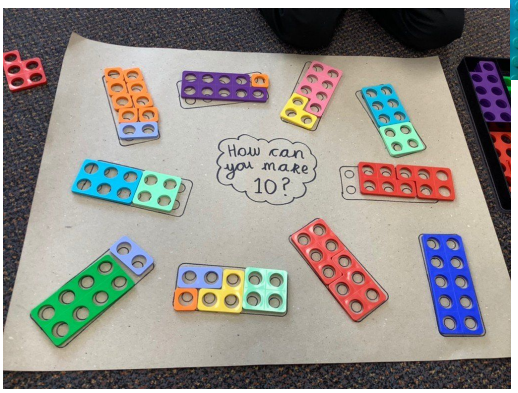
You can always ask…'What do you see?"

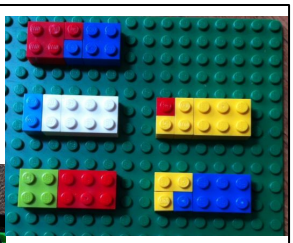


Try to **see** opportunities for talking mathematical in your everyday life with your child.

Manipulatives develops fluency







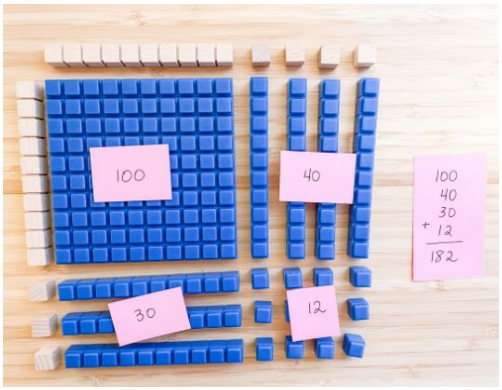
How could you show it in a different way?

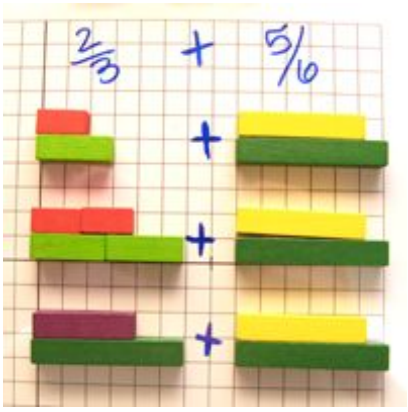
How do you know this shows...?

What would happen if I changed...?

Apparatus can be used to initially **develop** fluency, understanding and oracy (talking) about maths.

Manipulatives can be used to deepen learning





How does this show...?

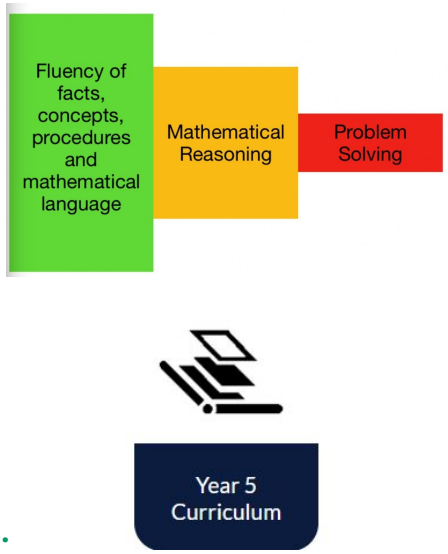
How is this different to?

Why did you decide to use...?

Apparatus can be used to extend understanding and develop a greater depth of a concept - which in turn is developing the key skill of flexibility of thought.

How can you help at home?

- Encourage your child to revise key fluency skills at home.
- Know what your child is learning (class blogs and curriculum pages).
- Use resources such as TT rockstars and Mathletics that are shared with you via class teachers.
- Show a positive attitude toward maths!



A word on tutors and programs such a Kumon Maths.

We ultimately want students to be efficient at problem solving, in any subject, job or life situation, but also in mathematical contexts at school. In order for them to reach this stage they must first have fluency in facts, procedures and concepts, then have an ability to talk about maths and show mathematical reasoning. Only then can they be fully successful at problem solving. All three of these skills occurs at every key stage of primary school. Year 1 students can show fluency, reasoning and problem solving but with age/stage dependent contexts.

Fluency - Recalling key mathematical concepts quickly and accurately, talking about mathematical concepts using key vocabulary , applying this knowledge when questions are shown in a different way (flexibility of thinking)

Reasoning - **explain** their thinking, drawing logical conclusion about mathematical concepts. Making connections and spotting patterns. Following a line of enquiry and proving or disproving this.

Problem solving - solving problems that may have more than one answer, might include many steps or might be a unique problem to solve

Anna

References:
https://thirdspacelearning.com/blog/fluency-reasoning-problem-solving/

Kumon Maths - these types of programs are okay, but it should be noted that sometimes they can introduce new concepts and ways of working out calculations that have not been covered in school yet. They are good to be used as a supplement but not always best as an intervention for children who need extra support with the key fluency objectives. If in doubt, ask the class teacher about use of tutors or programs. Parent meetings coming up after Songkran holiday are an ideal opportunity for this.

Tutor - same warning about different approaches to maths. Good if they can supplement and enhance learning in school. Good to look at curriculum pages to see what key learning for that term involves to build upon current learning. If children are enjoying learning with a tutor or an additional maths class, it is probably doing good. If they are not enjoying it, they are probably not getting much from it.

Opportunity to ask questions