Which is the odd one out and why?

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Upper School Maths Workshop Mrs Patey Ms Guest



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Our purpose today is to:

- Explain and demonstrate how mathematics is taught in Upper School at Holy Trinity.
- Build a positive mindset.
- Understand what is meant by 'mastery' in mathematics.
- Identify how fluency impacts on achieving mastery.
- Increase confidence and understanding in supporting your child at home.

Discuss 3 positive and negative experiences of Maths you had when you were a child.







If children hear 'I can't do maths' from parents, teachers, friends they begin to believe it isn't important.

People become less embarrassed about maths skills as it is acceptable to be 'rubbish at maths'



Fixed vs Growth mindset Carol Dweck



- We believe that everyone can get better at maths...when they put in the effort and work at it.
- Do not praise children for being clever when they succeed at something, but instead should praise them for working hard.
- Children learn to associate achievement with effort (which is something they can influence themselves – by working hard!), not 'cleverness' (a trait perceived as absolute and that they cannot change).





The Mastery Approach

Focus on children learning to **'reason mathematically, solve problems and develop mathematical fluency'** These are the key aims of the Mastery Curriculum.

...(Mastery) is about *deep*, secure *learning for all*, with extension of able students (more things on the same topic) rather than acceleration (rapidly moving on to new content).

Final Commission on the Commission on Assessment without Levels



What does it mean to master something?

- I know how to do it.
- It becomes automatic and I don't need to think about it e.g. driving.
- I'm really good at doing it, painting a room or a picture.
- I can show someone else how to do it.

Maths Hub

Mathematical Fluency - what is it and why is it important for my child?



"First they build up your confidence with simple addition and subtraction, then they slam you with algebra and calculus. It's quite a clever scheme."

What is fluency?

Students exhibit computational fluency when they demonstrate flexibility in the computational methods they choose, understand and can explain these methods, and produce accurate answers efficiently.

Mathematical Paper - US 2014



The three aspects of fluency with number

Efficiency - this implies that children do not get bogged down in too many steps or lose track of the logic of the strategy. An efficient strategy is one that the student can carry out easily, keeping track of sub-problems and making use of intermediate results to solve the problem. **Accuracy** depends on several aspects of the problem-solving process, among them 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, such as two-digit multiplication. Students need to be flexible in order to choose an appropriate strategy for the numbers involved, and also be able to use one method to solve a problem and another method to check the results.

So fluency demands more of students than memorising a single procedure – they need to understand why they are doing what they are doing and know when it is appropriate to use different methods.

How Fluency links to Mastery Maths

Children will be challenged to explain their thinking from the start. This is a key part of any lesson and mathematical language is at the heart of the mastery curriculum.





Concrete:

resources such as cubes, counters and shapes

Pictorial:

pictures, drawings

Abstract:

numbers and symbols

The beginning

Knowing everything there is to know about a number. What do you know about 7?

It is an odd number.It is a quarter of 28.It is made up of a 3 and a 4.It is two more than 5.It is made up of a 3 twos and a one.It is half of 14.It is three fewer than 10.It is a single digit number.It is double three and a half.It is a prime number.It comes after 6 and before 8.It is fewer than 10.

Starting Point in Key Stage 1 – concrete resources





Moving on to the Pictoral One example of this is the part-whole model



Here is the part-whole model used in the mastery curriculum. It works on the principle that if you know two values out of three in a calculation, you can calculate the missing value using addition or subtraction.

The two parts (3 and 4) combine to make the whole (7).



We can now use the model to find the missing 'part'





The part-whole model can be orientated differently, and is used for addition and subtraction problems or multiplication and division problems.



An unknown number and 4 makes 10. This leads to a missing box calculation:

+ 4 = 10 In other words, algebra. The National Curriculum requires that children know their number families for all the operations, for example:

6 + 4 = 10	3 × 7 = 21
4 + 6 = 10	7 × 3 = 21
10 – 6 = 4	21 ÷ 7 = 3
10 – 4 = 6	21 ÷ 3 = 7

The part-whole model

The part-whole model can involve more than two parts.

Here is an example from a Year 6 geometry lesson:





Activities and games

There are 7 cubes under the cups. You can only lift one cup up. Can you work out how many cubes are under the second cup?







I have 3 cups and 10 cubes. I've hidden the same number of cubes under both blue cups and a different number under the red cup. You can only lift one cup. Can you work out what is hiding under the other 2 cups without lifting them?



Another example of Pictoral is the Bar Model

Introducing the bar model

Omar bakes 10 biscuits. Ruby bakes 12 biscuits. How many biscuits do they bake altogether?



They bake 22 biscuits altogether.

This is an extract from Pupil Textbook 2A p.61 © 2015 Marshall Cavendish Education Pte Ltd

Introducing the bar model

Hardeep buys large eggs and small eggs.Altogether he buys 20 eggsThere are 7 small eggs.How many large eggs are there?



There are 13 large eggs.

This is an extract from Pupil Textbook 2A p.62 © 2015 Marshall Cavendish Education Pte Ltd

Extending the bar model to multiplication

Peter puts 5 bread rolls into each packet.

He has 4 packets.

How many bread rolls does he put into the 4 packets altogether?



There are 20 bread rolls altogether.

This is an extract from Pupil Textbook 2A p.132 © 2015 Marshall Cavendish Education Pte Ltd

It can also be used to help children to understand ratio





Tim and Sally share marbles in the ratio of 2:3 If Sally has 36 marbles, how many are there altogether?

Back to the Start!

Tai saves 4 times as much money as Farha. Ruby saves £12 less than Tai. Farha saves £32. How much money does Ruby save?



This is an extract from Pupil Textbook 3A p.115 © 2015 Marshall Cavendish Education Pte Ltd

Back to the start.....

Tai saves 4 times as much money as Farha. Ruby saves £12 less than Tai. Farha saves £32. How much money does Ruby save?



This is an extract from Pupil Textbook 3A p.115 © 2015 Marshall Cavendish Education Pte Ltd

Finally we move onto abstract

These are our more formal written calculations and our school follows the progression of calculation document which you can access from the school website.

End of Year Expectations	Possible Concrete and Visual Representations	Teacher Modelling/Children's Recording	Fluency
Year 3 Add numbers with up to three-digits (leading to formal written column method)	1 2 3 4 6 7 4 9 16 11 12 13 16 16 17 18 18 17 18 18 17 18 18 17 18 18 17 18 18 17 18 18 17 18 18 17 18 18 17 18 18 18 17 18 18 18 18 18 18 18 18 18 18 18 18 18 18 18 18 18 18 18 19 19 10	Children apply, develop and secure their understanding of place value and begin to record in columns <u>Manipulatives SHOULD be used alongside algortihms</u> Column addition (no exchanging) with up to three-digits	Count in ones, tens and hundreds maintaining fluency through varied and frequent practice
ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD MORE THAN TWO NUMBERS WITH DIFFERING NUMBERS OF DIGITS	17 15 10<	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	Count from 0 in multiples of 4, 8, 50 and 100 Find 10 or 100 more than a number
Children should partition numbers, up to 1000, in different ways e.g. 100 + 40 + 6 or 100 + 30 + 16	Hundreds 100 s 200 200 200 200 200 200 200 200 200	Expanded recording without exchange Expanded recording with exchange	Mentally add HTU + ones, HTU + tens, HTU + hundreds Perform mental
Solve problems in different contexts including missing number problems		$ \begin{array}{r} 100 + 40 + 1 \\ + 100 + 20 + 8 \\ \hline 200 + 60 + 9 = 269 \\ \hline \hline 269 \end{array} $	calculations with two- digit numbers, the answer could exceed 100

Add numbers with up to fourdigits (formal written column method) including numbers with up to two decimal places in the context of money

ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD MORE THAN TWO NUMBERS INCLUDING DECIMALS, WITH DIFFERING NUMBERS OF DIGITS

Solve two-step problems in different contexts including missing number problems



Expanded recording	Compact (column) recording	
	Column addition (with exchanging)	Count in 6s, 7s, 9s, 25s and 100s
1		Find 1000 more than a number
HTU 789 +642 1431	$ \begin{array}{r} f 7.89 \\ + f 6.42 \\ \hline f 14.31 \\ \hline 1 1 \end{array} $ Add decimals in the context of money	Perform mental calculations with increasingly large numbers to aid fluency
Compact (c	column) recording	Babcock 4S Progression in Calculation

End of Year Expectations	Possible Concrete and Visual Representations	Teacher Modelling/Children's Recording	Fluency	
Year 5 Add numbers with more than four-digits and decimals up to three places (formal written column method)	0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.06 0.09 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 2 3 4 5 6 7 8 9 ^^~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Manipulatives could be used alongside algorithms	Count forwards in powers of ten up to 100000	
N.B. ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD MORE THAN TWO NUMBERS INCLUDING DECIMALS, WITH DIFFERING NUMBERS OF DIGITS	U 1/10 1/100	$ \begin{array}{r} 21.41 \\ +1.12 \\ 0.35 \end{array} $	Count forwards in positive and negative whole numbers through zero Practise mental calculations with increasingly large numbers Practise fluency of written methods	
Solve multi-step problems selecting and justifying methods Perform mental calculations with increasingly large numbers	1 0.1 0.01 1 0.1 0.01	<u>3269</u> <u>22.88</u> Column addition (no exchanging)		
	Cuisenaire			

Year 6

Add numbers with more than four-digits and decimals up to three places

(formal written column method)

N.B. ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD **MORE THAN** TWO NUMBERS, INCLUDING DECIMALS, WITH DIFFERING NUMBERS OF DIGITS

Solve more complex calculations mentally

Solve multi-step problems in contexts, deciding which operations and methods to use and why



5189 +3128	51.89 + 3.128	Count in t
8317	5 5. 0 1 8	increasin and
11	1 1	

Column addition (with exchanging)

Addition with decimals up to three decimal places including in different contexts e.g. money and measures Count in tens and hundreds increasing fluency of order and place value

Perform increasingly complex mental calculations and those with increasingly large numbers to aid fluency

> Babcock 4S Progression in Calculation

Problems that encourage mathematical thinking are key to fluency

Pairs of Numbers

Stage: 1 ★

12345678910

If you have ten counters numbered 1 to 10, how many can you put into pairs that add to $10?\,$

Can you use them all? Say how you got your answer.

Now put the counters into pairs to make 12.

- Can you use them all?
- Say how you got your answer.

Now put the counters into pairs to make 13.

- Can you use them all?
- Say how you got your answer.

Now put the counters into pairs to make 11.

- Can you use them all?
- Say how you got your answer.



Games of strategy can help 1. Player 1 chooses a target to reach. This is the total both players try to make.

2. Player 2 places their counter on the game board over one of the numbers and says that number.

3. Player 1 moves the same counter in any direction along a line segment to a neighbouring number and announces the total of the two numbers.

4. Player 2 moves the same counter to cover a neighbouring number, adds on that number, and announces the 'running' total of the three numbers.

5. Players take it in turns to slide the counter to cover a neighbouring number and to add that number to the 'running' total.

6. Players must move when it is their turn.

7. No 'jumping' is allowed.

Shape Times Shape

Stage: 2 ★

The coloured shapes stand for eleven of the numbers from $0\ \mbox{to}\ 12.$ Each shape is a different number.

Can you work out what they are from the multiplications below?



There are a number of resources on our school website that can help you to feel more confident in understanding how your child is learning maths and how you can best support them.

Number of the Day sheets



Knowledge Organisers

Addition and Subtraction

Knowledge Organiser



Knowledge Organiser Addition and Subtraction **Check Answers** Estimate Estimate by dividing the hundred into 250 and 225. 347 Estimate 10s (330, 340) between 325 and 350. 273 74 347 - 74 = 273 can be checked using 273 + 74 = 347200 300 This part whole shows the inverse calculations using these three numbers. Estimate 167 – 89 Use near numbers 170 – 90 = 80 423 Near numbers: 269 154 279 413 521 782 154 + 269 = 423269 + 154 = 423400 300 500 800 423 - 154 = 269 423 - 269 = 154

Maths Vocabulary Mats



How can I help my child?

You can help your child by finding and talking about maths in everyday situations. For example, a shopping trip is rich in mathematical opportunities, such as:

- spending money, calculating change and working out which offers give the best value for money.
- empty packaging can provide your child will immediate access to 3D shapes and nets.
- using packets and tins as a source of mathematical information to discuss, such as mass and volume.
- using items often sold in pairs, fours and sixes (such as drinks or yogurts) to talk about multiples or times tables.

How can I help my child?

You can also help your child in a number of other ways:

- Encourage a secure knowledge of number, by asking questions which help them explain what comes before or after a given number, or how the number is made, for example tens and ones.
- Encourage them to *draw pictures and models* such as part-whole and bar models to answer questions.
- Support them with home activities, and encourage them to answer questions in full sentences.
- Visit the Holy Trinity website for additional resources.
- If you are unsure about any concepts, please ask your child's teacher to explain how it is taught and how you can support your child.

We will be introducing a weekly competition between the classes in LKS2 and UKS2. There will be weekly Rock Legend Classes and we also hope to link this to our number day later this year

Please encourage your children to use **TTRockstars or Numbots** regularly as those key number skills are key to their maths fluency.

How to navigate the Holy Trinity Website:

Visit Curriculum – Subjects – Maths – Useful resources for parents or Useful websites