"And a strange sight it was, this tiny dark-haired person sitting there with her feet nowhere near touching the floor, totally absorbed in the wonderful adventures..."

kids activities Blog

MATH:

YOU SHOULD NOT *only* KNOW WHAT YOU ARE DOING. YOU SHOULD ALSO KNOW

WHY & HOW

HARRY WONG

Session Aims

- What does maths look like in KS2?
- How is maths taught at Hatfeild?
- How can children be supported at home?

What are our underlying principles in maths teaching at Hatfeild?

C- P- A = concrete

Concrete is the “doing” stage.

During this stage, pupils use concrete objects to model problems.

The CPA approach brings concepts to life by allowing children to experience and handle physical (concrete) objects.

Example: There are 4 apples in a bowl, I buy 3 bowls. Altogether I buy 12 apples.

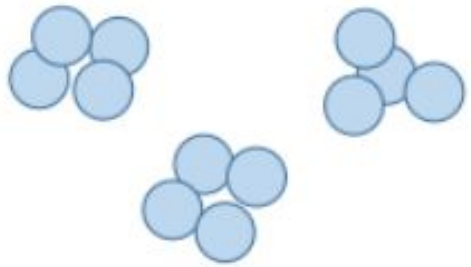
C-P-A =Pictorial

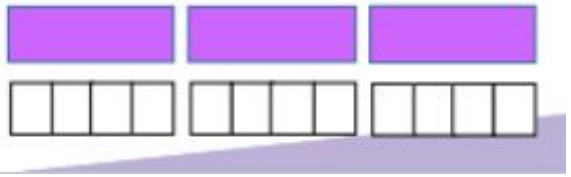
Pictorial is the “seeing” stage.

Visual representations of concrete objects are used to model problems.

This stage encourages children to make a mental connection between the physical object they just handled and the abstract pictures, diagrams or models that represent the objects from the problem.

Building or drawing a model makes it easier for children to grasp difficult abstract concepts (for example, fractions). Simply put, it helps students visualise abstract problems and make them more accessible.





C-P-**A = Abstract**

Abstract is the “symbolic” stage, where children use abstract symbols to model problems.

Children will not progress to this stage until they have demonstrated that they have a solid understanding of the concrete and pictorial stages of the problem.

The abstract stage involves the teacher introducing abstract concepts (for example, mathematical symbols).

Children are introduced to the concept at a symbolic level, using only numbers, notation, and mathematical symbols (for example, +, –, x, /) to indicate addition, multiplication or division.

$$3 \times 4 =$$

Why is CPA so important?

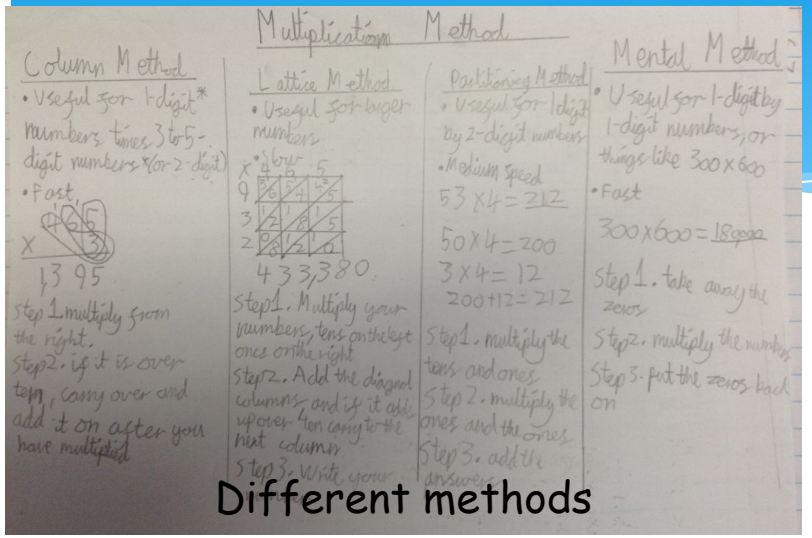
- It gives children a deep understanding of maths.
- ***Concrete resources*** give pupils time to investigate a concept first - and then make connections when formal methods are introduced.
- The ***pictorial stage*** allows pupils to demonstrate and sustain their understanding of mathematical concepts and processes
- The ***abstract stage*** should run alongside the concrete - pictorial stage. This is the final written equation stage.

Year 3	• Numbers up to 1000, and once confident, moving beyond to 4 digits • Decimals to one place	• Numbers up to 1000 (+/-) • Two-digit numbers (x/÷)	• Two-digit numbers with answers possibly exceeding 100 (+/-) • Recall and use of known multiplication and division facts • Two-digit numbers by one-digit (x/÷)
Year 4	• Four-digit numbers • Decimals to two places	• Up to four-digit numbers (+-/) • Two and three-digit numbers (x/÷)	• Two and three digit numbers (+/-) e.g. 653 + 60 • Recall and use of known multiplication and division facts • Two-digit numbers by one-digit (x/÷), moving to three-digits using derived facts
Year 5	• Numbers up to 1 000 000 • Decimals up to three places	• Whole numbers with more than 4 digits (+/-) • Decimals to two places (+/-) • Four-digit numbers (x/÷)	• 'Increasingly large numbers' (+/-) e.g. 12 462 – 2300 • Recall and use of known multiplication, division and derived facts
			• Decimals to one place (+/-)
Year 6	• Numbers up to 10 000 000 • Negative numbers • Decimals up to three places	• Numbers up to 4 digits (x/÷) • Decimals to two places (x/÷)	• 'Increasingly large numbers and more complex calculations'

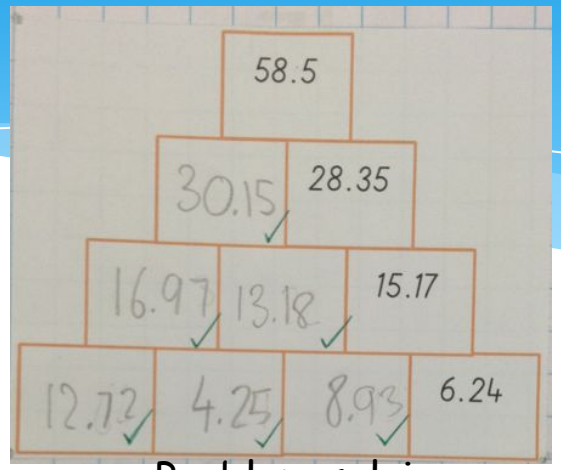
What do we want to see in our maths?

-

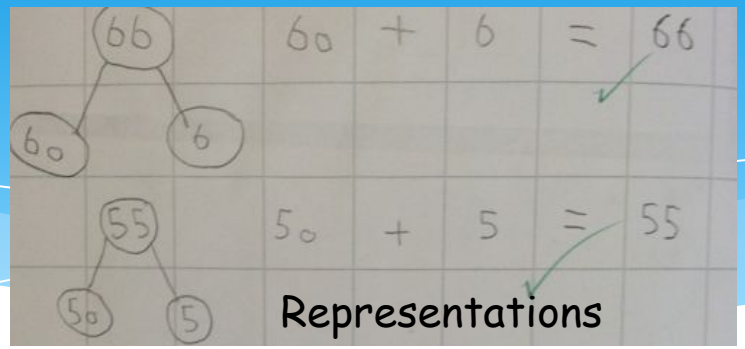
What do we want to see in our Maths at Hatfeild?



Different methods

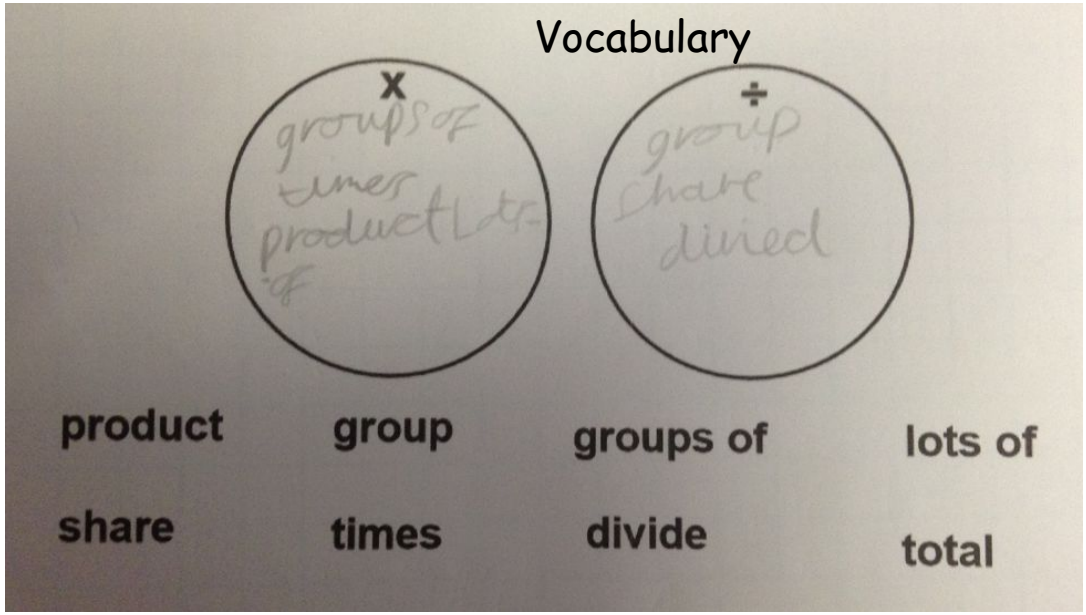


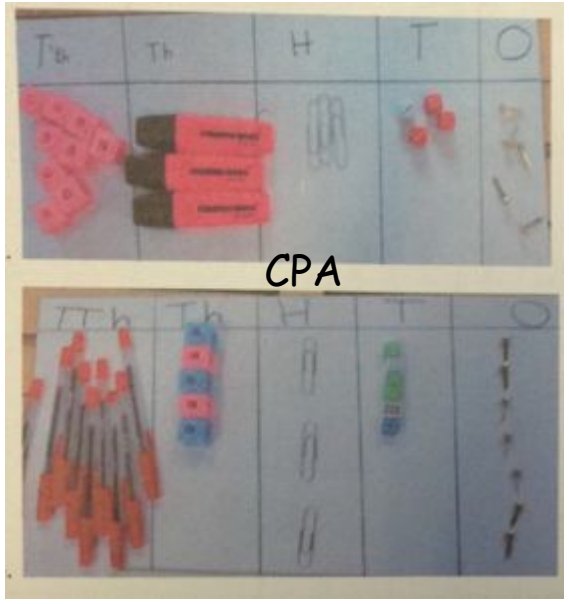
Problem solving



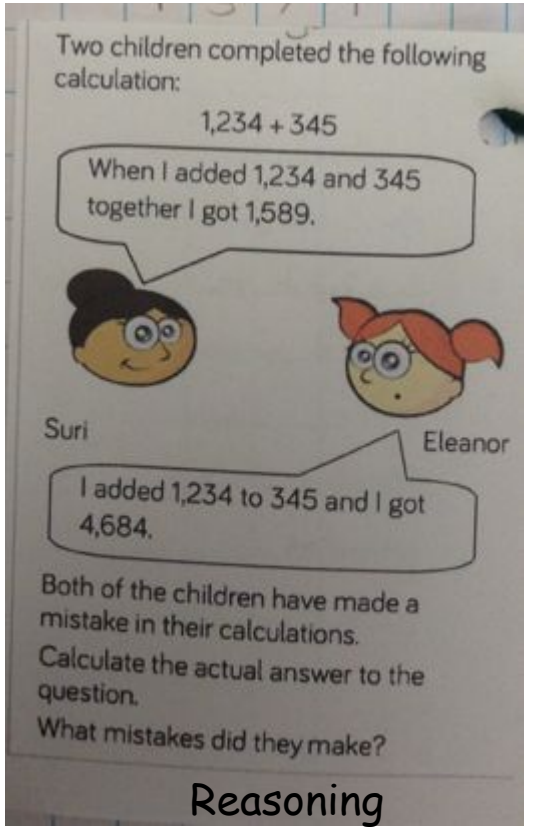
Representations

Vocabulary





CPA



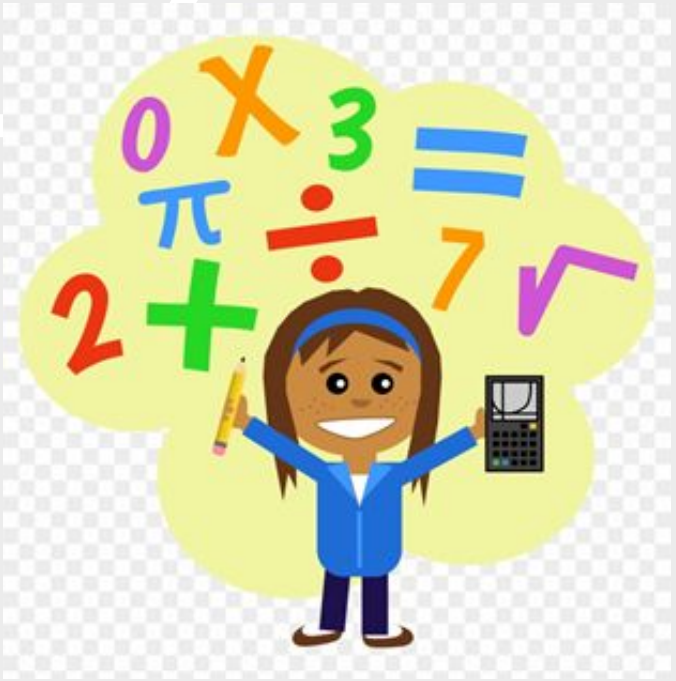
Reasoning

Calculation Policy

Our calculation policy is in line with the programmes of study taken from the National Curriculum for Mathematics (2014). It is designed to be challenging, focussing on essential core subject knowledge and skills.

This document guides you through the **appropriate calculation methods within each year group** and the **progression** of skills **throughout the school**.

The content of this document is set out in year group blocks under the following headings: **addition, subtraction, multiplication and division**.

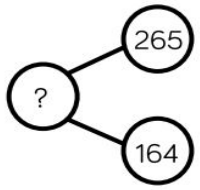


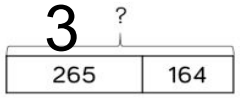
White-Rose-calculation-policy

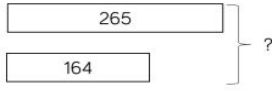
Primary Maths Dictionary

Addition Calculation

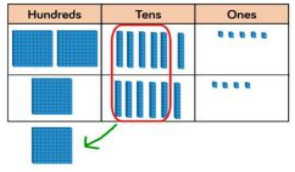
Year 3



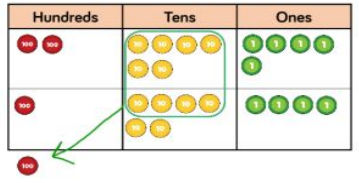




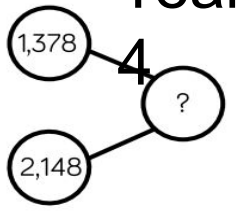
$265 + 164 = 429$

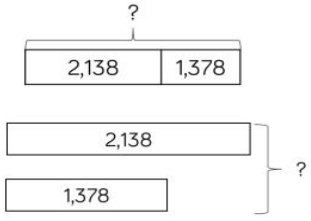


$$\begin{array}{r} 265 \\ +\ 164 \\ \hline 429 \\ \hline 1 \end{array}$$



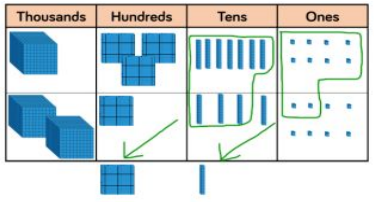
Year 4

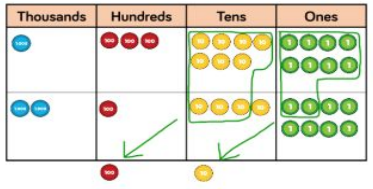




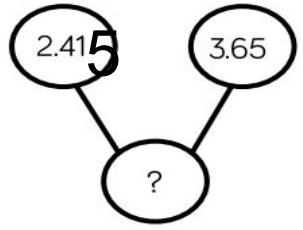
$$\begin{array}{r} 1\,3\,7\,8 \\ +\ 2\,1\,4\,8 \\ \hline 3\,5\,2\,6 \\ \hline 1\ 1 \end{array}$$

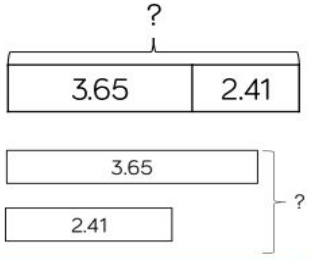
$1,378 + 2,148 = 3,526$





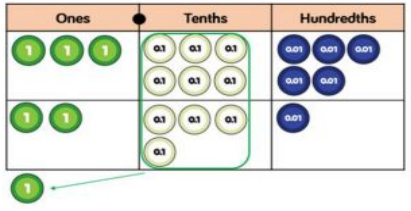
Year 5

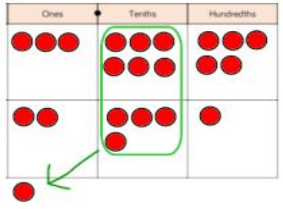




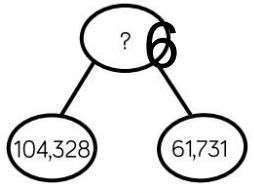
$$\begin{array}{r} 3.65 \\ +\ 2.41 \\ \hline 6.06 \\ \hline 1 \end{array}$$

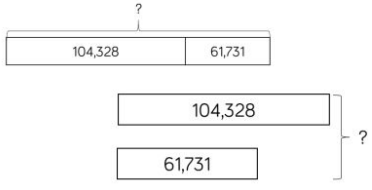
$3.65 + 2.41 = 6.06$



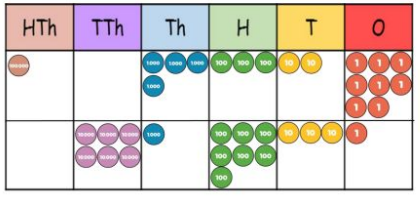


Year 6



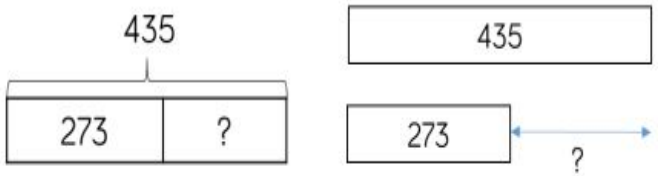


$104,328 + 61,731 = 166,059$

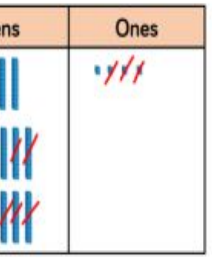


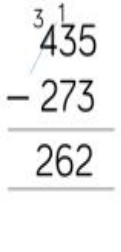
$$\begin{array}{r} 1\,0\,4\,3\,2\,8 \\ +\ 6\,1\,7\,3\,1 \\ \hline 1\,6\,6\,0\,5\,9 \\ \hline 1 \end{array}$$

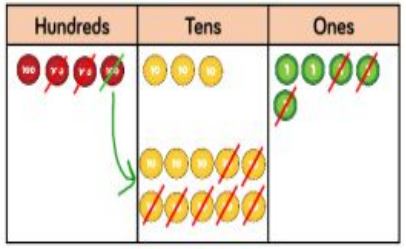
Year 3	Year 4	Year 5	Year 6
• add and subtract numbers mentally, including: ➢ a three-digit number and ones ➢ a three-digit number and tens ➢ a three-digit number and hundreds • add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	• add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate	• add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) • add and subtract numbers mentally with increasingly large numbers	• perform mental calculations, including with mixed operations and large numbers • use their knowledge of the order of operations to carry out calculations involving the four operations



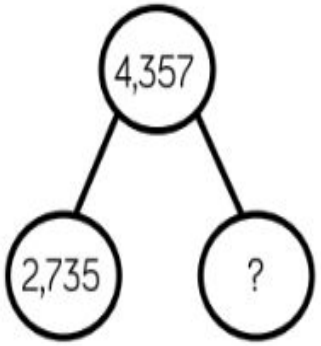
435 – 273 = 262

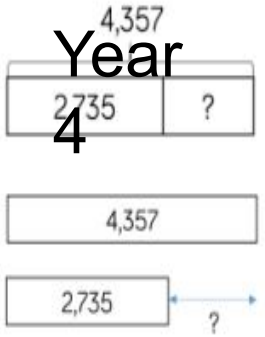




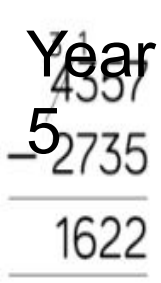


Year 4

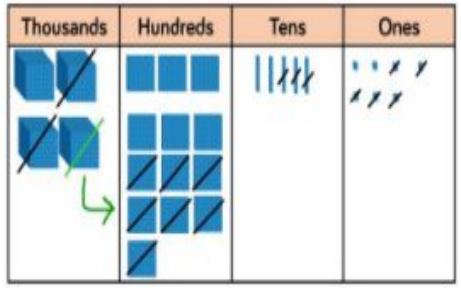


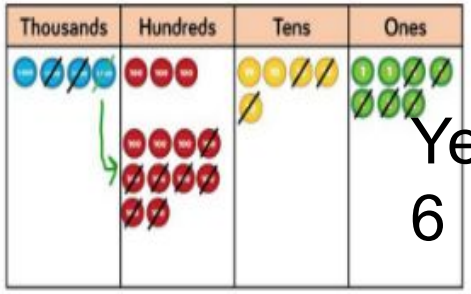


Year 5

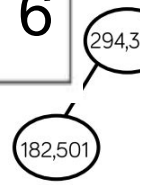


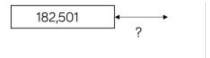
4,357 – 2,735 = 1,622



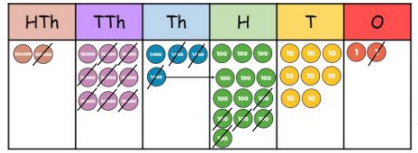


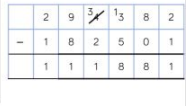
Year 6

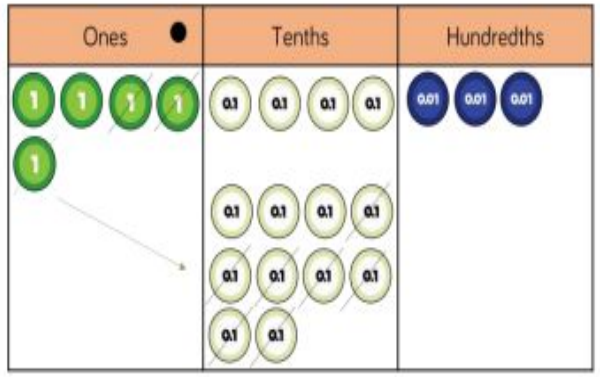


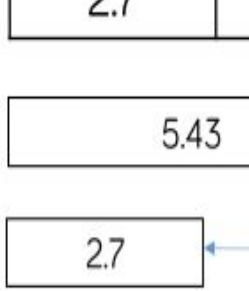


294,382 – 182,501 = 111,881







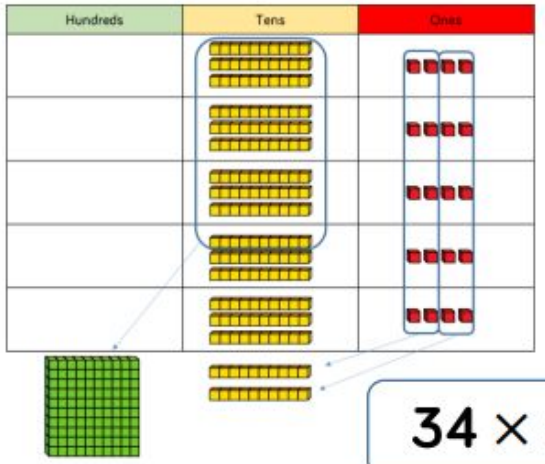


5.43 – 2.7 =

Year 3	Year 4	Year 5	Year 6
• add and subtract numbers mentally, including: ➢ a three-digit number and ones ➢ a three-digit number and tens ➢ a three-digit number and hundreds • add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	• add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate	• add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) • add and subtract numbers mentally with increasingly large numbers	• perform mental calculations, including with mixed operations and large numbers • use their knowledge of the order of operations to carry out calculations involving the four operations

Multiplication Calculation Policy

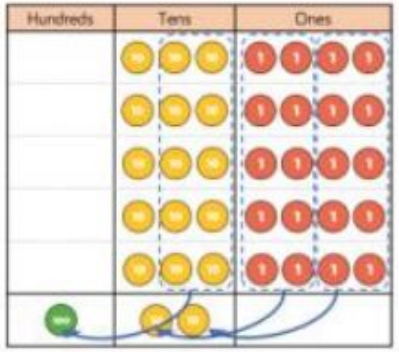
Year 3 and 4

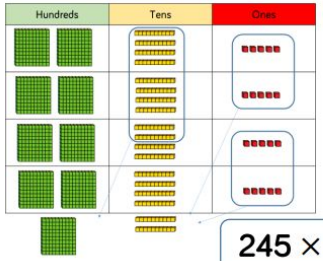


	H	T	O	
		3	4	
×			5	
		2	0	(5 × 4)
+	1	5	0	(5 × 30)
	1	7	0	

$34 \times 5 = 170$

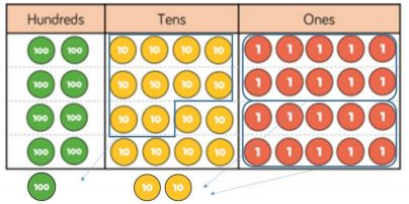
	H	T	O	
		3	4	
×			5	
	1	7	0	
	1	2		





	H	T	O
	2	4	5
×			4
	9	8	0
	1	2	

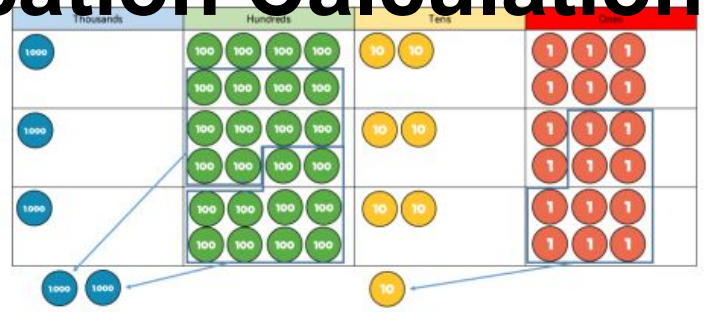
$245 \times 4 = 980$



Year 3	Year 4
• write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods	• multiply two-digit and three-digit numbers by a one-digit number using formal written layout

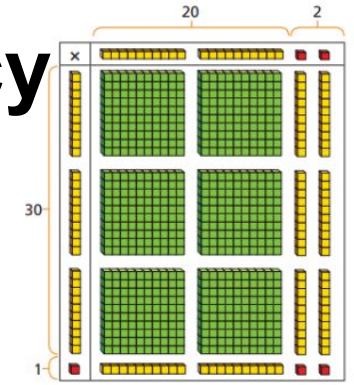
Multiplication Calculation Policy

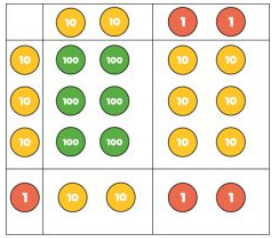
Year 5 and 6



1,826 × 3 = 5,478

	Th	H	T	O
	1	8	2	6
×				3
	5	4	7	8
	2		1	

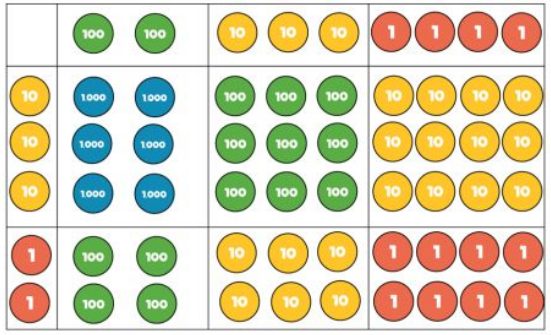




×	20	2
30	600	60
1	20	2

	H	T	O
		2	2
×		3	1
		2	2
	6	6	0
	6	8	2

22 × 31 = 682



	Th	H	T	O
		2	3	4
×			3	2
		4	6	8
1	7	1 0	2	0
	7	4	8	8

×	200	30	4
30	6,000	900	120
2	400	60	8

234 × 32 = 7,488

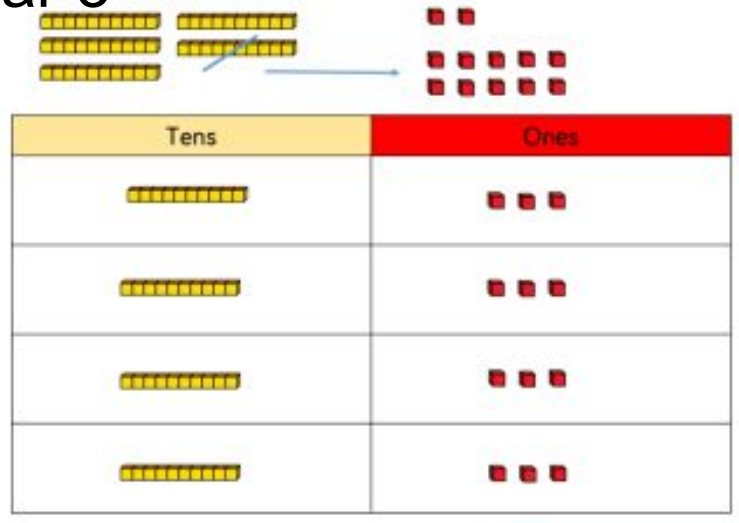
TTh	Th	H	T	O
	2	7	3	9
×			2	8
2 2	1 5	9 3	1 7	2
1 5	4	7 1	8	0
7	6	6	9	2
		1		

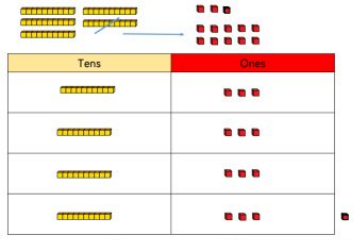
2,739 × 28 = 76,692

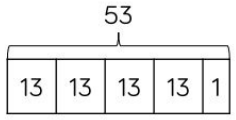
Year 5	Year 6
• multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers • multiply and divide numbers mentally drawing upon known facts • divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context • multiply and divide whole numbers and those involving decimals by 10, 100 and 1000	• multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication • divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context • divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context • perform mental calculations, including with mixed operations and large numbers

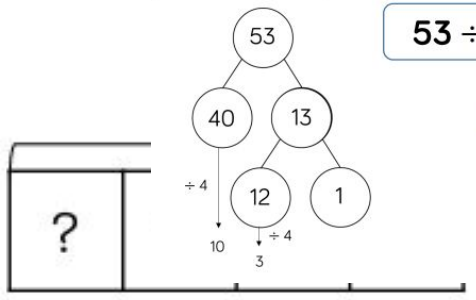
Division Calculation Policy

Year 3





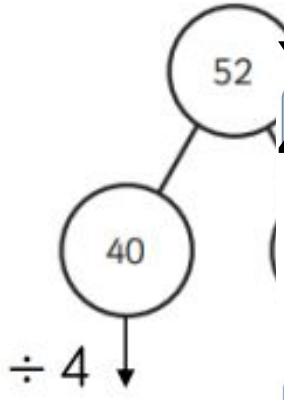




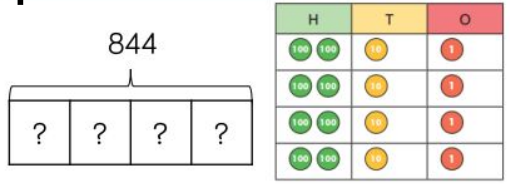
53 ÷ 4 = 13 r1

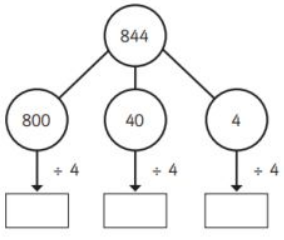
Year 4

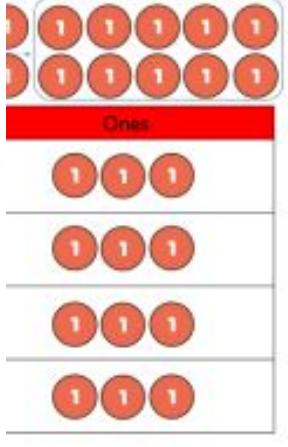
52 ÷ 4 = 13



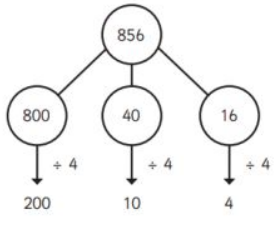
844 ÷ 4 = 211

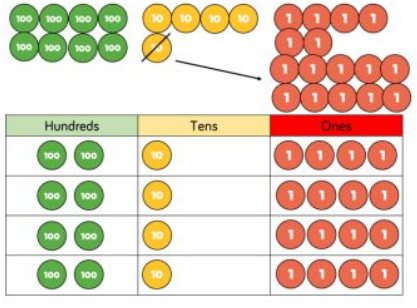






844 ÷ 4 = 211



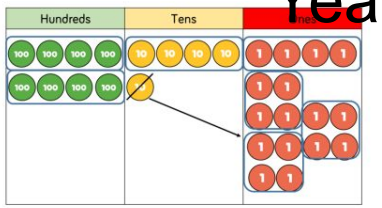


Year 3 /4

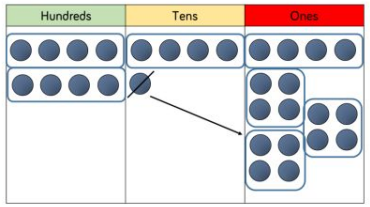
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

Division Calculation Policy

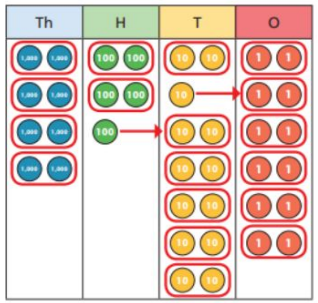
Year 5 and Year 6



		2	1	4
	4	8	5	$^{1}6$



856 ÷ 4 = 214



		4	2	6	6
2	8	5	$^{1}3$	$^{1}2$	

8,532 ÷ 2 = 4,266

		0	3	6	
1	2	4	3	2	(×30)
	–	3	6	0	
			7	2	(×6)
	–		7	2	
				0	

12 × 1 = 12
12 × 2 = 24
12 × 3 = 36
12 × 4 = 48
12 × 5 = 60
12 × 6 = 72
12 × 7 = 84
12 × 8 = 96
12 × 7 = 108
12 × 10 = 120

432 ÷ 12 = 36

		0	3	6
	12	4	$^{4}3$	$^{7}2$

432 ÷ 12 = 36

		0	4	8	9	
15	7	3	3	5		
–	6	0	0	0	(×400	
	1	3	3	5		
–	1	2	0	0	(×80)	
		1	3	5		
–		1	3	5	(×9)	
				0		

1 × 15 = 15
2 × 15 = 30
3 × 15 = 45
4 × 15 = 60
5 × 15 = 75
10 × 15 = 150

7,335 ÷ 15 = 489

		0	4	8	9
15	7	$^{7}3$	$^{13}3$	$^{13}5$	

7,335 ÷ 15 = 489

15	30	45	60	75	90	105	120	135	150

372 ÷ 15 = 24 r12

			2	4	r	1	2
1	5	3	7	2			
	–	3	0	0			
			7	2			
	–		6	0			
			1	2			

1 × 15 = 15
2 × 15 = 30
3 × 15 = 45
4 × 15 = 60
5 × 15 = 75
10 × 15 = 150

			2	4	$\frac{4}{5}$
1	5	3	7	2	
	–	3	0	0	
			7	2	
	–		6	0	
			1	2	

372 ÷ 15 = $24\frac{4}{5}$

Year 5

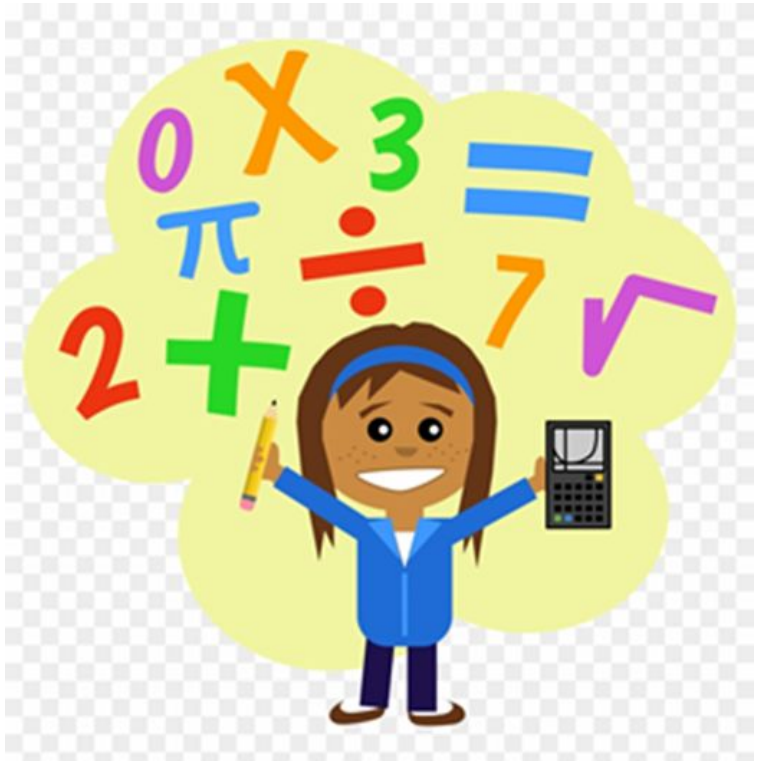
- multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers
- multiply and divide numbers mentally drawing upon known facts
- divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000

Year 6

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
- divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- perform mental calculations, including with mixed operations and large numbers

Questioning and Talk

- Your turn now: which is the odd one out? Why?



42

246

57

46

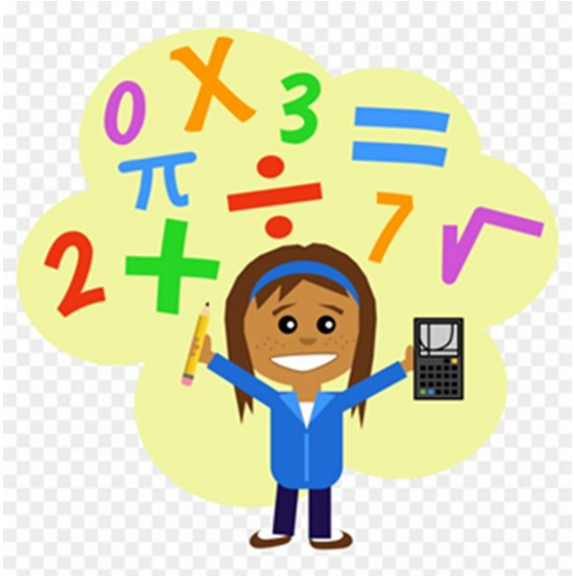
'Teachers can provide regular opportunities for pupils to develop independent metacognition through pupils explaining to themselves, teachers and other pupils how they planned, monitored, and evaluated their completion of a task.'

'By giving our students practice in talking with others, we give them frames for thinking on their own.'

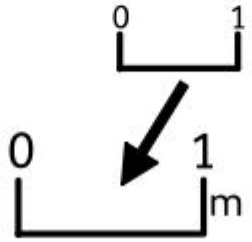
Vygotsky, L. (1978)

Good questions, and equally important, good listening can help children make sense of mathematics, build their confidence, and encourage mathematical thinking and communication. A good question opens up a problem and supports different ways of thinking about it. Some questions to try while helping a child might include:

- What do you already know about this?
- What do you need to find out?
- How might you begin?
- How can you organise your information?
- Can you draw a picture to explain your thinking?
- Are there other possibilities?
- What would happen if …?
- What do you need to do next?



The importance of mathematical vocabulary …and talk

$a*b=b*a$ commutative	 exchange	247 200 40 7 partitioning
 3 x 2 = product	 scaling	2 +3 5 sum

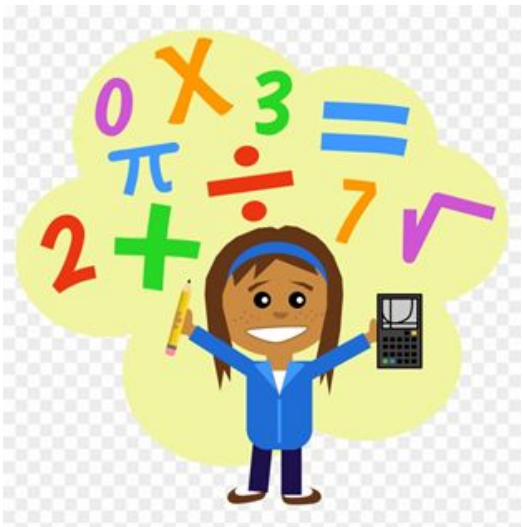
We also need to think about the vocabulary. This is the vocabulary that children would need to be secure in by the end of Year 2. Year 1 has 3 pages of this!

New maths vocabulary for year 2						
Number and place value	Measure	Geometry (position and direction)	Geometry (properties of shape)	Fractions	Data/statistics	General/problem solving
Numbers to one hundred Hundreds Partition, recombine Hundred more/less	Quarter past/to m/km, g/kg, ml/l Temperature (degrees)	Rotation Clockwise, anticlockwise Straight line Ninety degree turn, right angle	Size Bigger, larger, smaller Symmetrical, line of symmetry Fold Match Mirror line, reflection Pattern, repeating pattern	Three quarters, one third, a third Equivalence, equivalent	Count, tally, sort Vote Graph, block graph, pictogram, Represent Group, set, list, table Label, title Most popular, most common, least popular, least common	Predict Describe the pattern, describe the rule Find, find all, find different Investigate

Reasoning is…

The action of thinking about something in a logical, sensible way

Progression in Reasoning



Describing	Simply tells what they did
Explaining	Offers some reasons for what they did (may or may not be correct)
Convincing	Confident that their chain for reasoning is right (inductive reasoning)
Justifying	A correct logical argument that has a complete chain of reasoning
Proving	A watertight argument that is mathematically sound (deductive reasoning)

NRICH (2014)

Reasoning and problem solving

Jack says,

Explain why Jack is **not** correct.

11 At the start of April, a shop had **15,000** games.

The shop sold:

- **7,918** games in April
- **4,624** games in May.

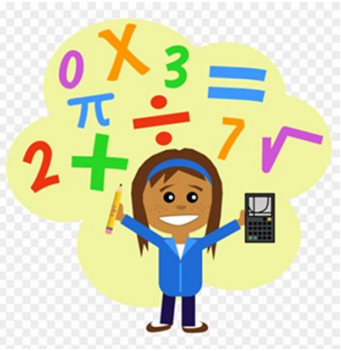
How many games did the shop have left at the end of May?

Show your method

games

Imagine if you did not have those skills or strategies….. How hard would it have been to solve those questions.

Importantly, in preparation for not only their SATs but their Secondary Schools they will go to, it is important that children work on their fluency:



A quick guide to everyday Maths opportunities for your child

* Practise spotting and recognising numbers in the environment. Add/multiply/subtract/divide door numbers, numbers on car registration plates, road signs and at the shop.
* Flicking through the TV guide? Ask your child to calculate the length of their favourite programmes. How long is it until the next programme?
* Use food packaging to discuss 2D and 3D shapes. What are the properties of these shapes e.g. how many faces, sides, vertices? Flatten the packaging out to find the net of the 3D shape too.
* Measuring up for new furniture? Want to make sure the Christmas tree will fit in your living room? These are really good opportunities to encourage your child to see the value of careful measuring skills in everyday life.
* Practise telling the time with your child. Can they read both the digital and analogue clock? Can they readily convert between the two and use the 24 hour clock? Can they also recognise Roman Numeral representations of the time too?
* Board Games supply endless opportunities for Maths – Snakes and Ladders, Monopoly, Bingo, Connect Four, Battle Ships etc

How can you help your child with Maths at home?

* Take away their fear.
* Let your child know you believe they can be successful in maths
* Encourage and support risk taking and celebrate perseverance.
* Encourage your children to solve problems with you.
* Help them identify different methods or strategies to use in finding solutions and resist the temptation to provide the answer or method.
* There is usually more than one way to solve a problem, and simpler strategies are often effective.
* Provide opportunities for your child to explain and justify their thinking.
* Seeing mistakes as an opportunity to learn and using them as a discussion point.

And finally …

Some Dos…

• Play (maths) with your child -There are opportunities for impromptu learning in games with real people

• Recognise that there is more than one way of doing calculations - You may have learned one method, but children are actively encouraged to seek out alternative methods in school and choose one which works for them, no matter how long winded

• Talk about how your child has found an answer. Encourage them to make connections or talk about what they notice. If they use a word that is unfamiliar to you when talking about maths, get them to explain and show you the meaning

• Be an actor - Get excited about maths and your child will get excited too

…And Some Don'ts!

- Don't expect them to understand after you've explained it once - It is normal for a child to 'get it' one day, and then in a different context not know how to find an answer

- Don't get into an argument over homework - It will be something that your child has covered in class, and if they really can't do it without a lot of tears and frustration, leave it and let us know!

Thank you for listening.

We hope the workshop helps you understand how you can support your child at home.