KS2 Maths Parent Workshop

Grange Park Primary School

Led by Elena Yiapanis: Assistant Headteacher and Maths Subject Leader

Aims of the today's session:

- Look at our calculation policy with a focus on the four operations (addition, subtraction, multiplication and division)
- Discuss how mathematics is taught through a CPA approach (Concrete- Pictorial- Abstract)
- Look at the the concrete resources that we use at school to support mathematical teaching and learning
- Discuss the importance of oracy in maths and mathematical language
- An insight into the 'teaching for mastery' approach to mathematics
- How to support children in adopting a growth mindset in maths so they can achieve their potential.
- How to support your children at home with their maths learning

CPA Approach: Concrete Pictorial Abstract

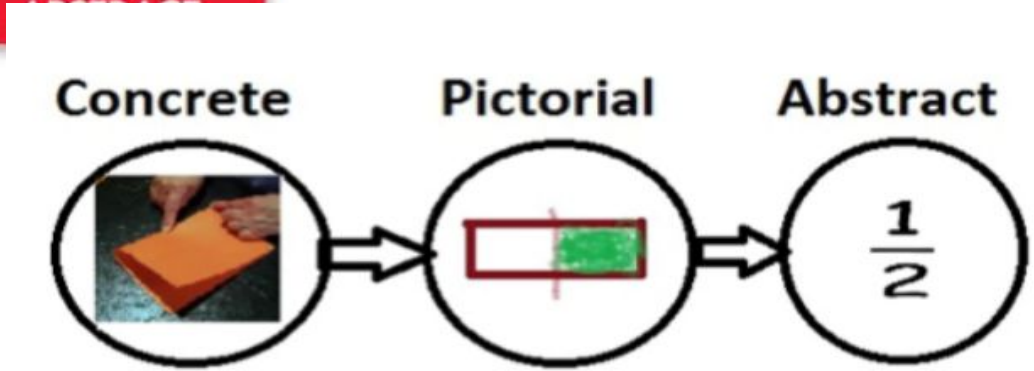
- **Concrete:** 'doing' the maths- introducing real objects that can be manipulated to bring the problem to life. Eg: money, counters.

- **Pictorial**: 'seeing the maths'- making connections between the concrete and the pictorial representations and the pictorial and the abstact. Eg: part whole models, bar models, ten frames.

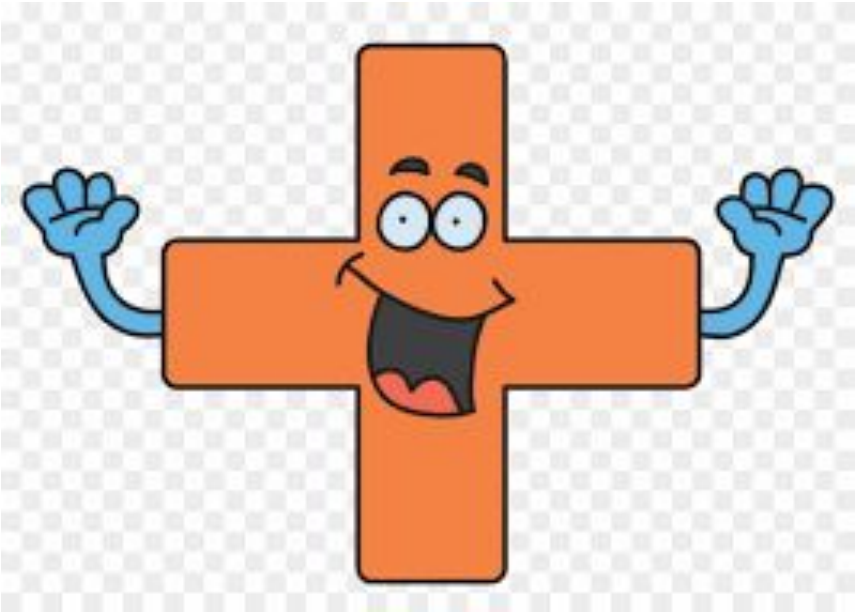
- **Abstract:** the ultimate goal is for children to understand abstract mathematical concepts, signs and notation. When a child demonstrates with concrete models and pictorial representations that they have grasped a concept, we can be confident that they are ready to explore the abstract.

The CPA Approach

Maths should be practical for all ages and the CPA approach used at any time and with any age to support understanding



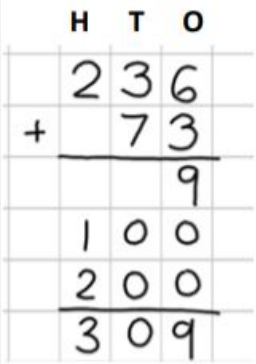
Addition in KS2



Calculation policy

Y3

- Continue with partitioned columnar method.
- Introduce expanded columnar addition.



Progressing to the compact columnar method.

TO	HTO	TO	HTO	TO	HTO
23	315	94	561	47	237
+ 42	+ 624	+ 73	+ 718	+ 25	+ 516
65	939	167	1279	72	753
				1	1

Addition of 3 digit numbers

Alongside the manipulatives (for understanding) you will notice we add one column at a time.

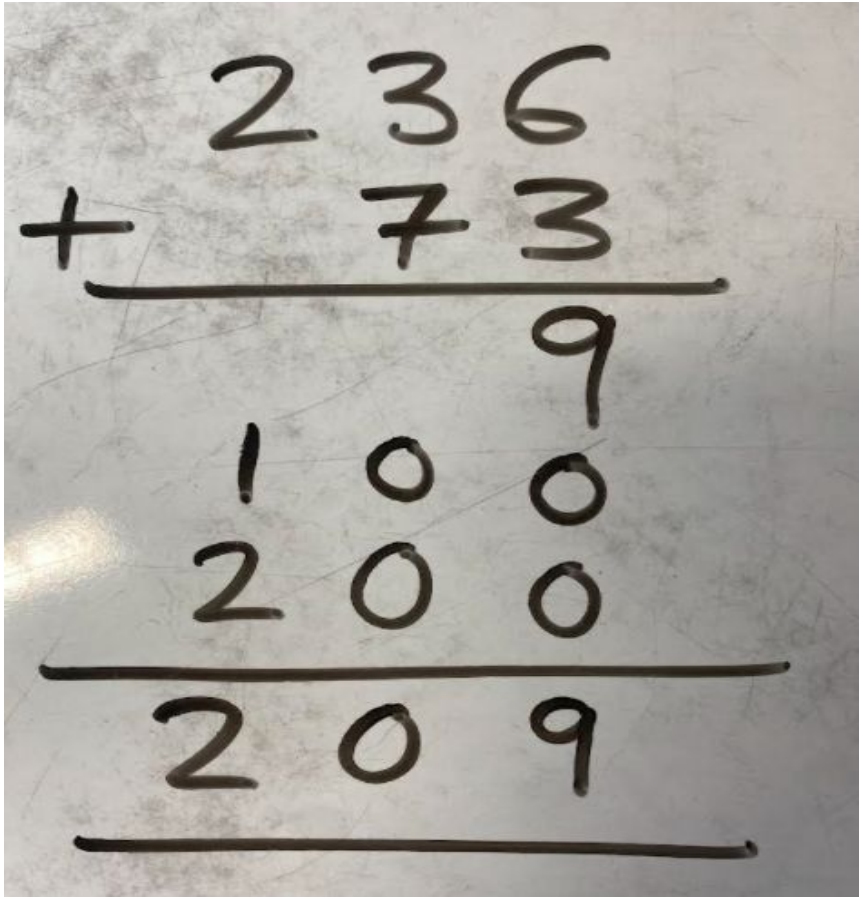
First the ones - say it then record it.

Then the tens - say it then record it.

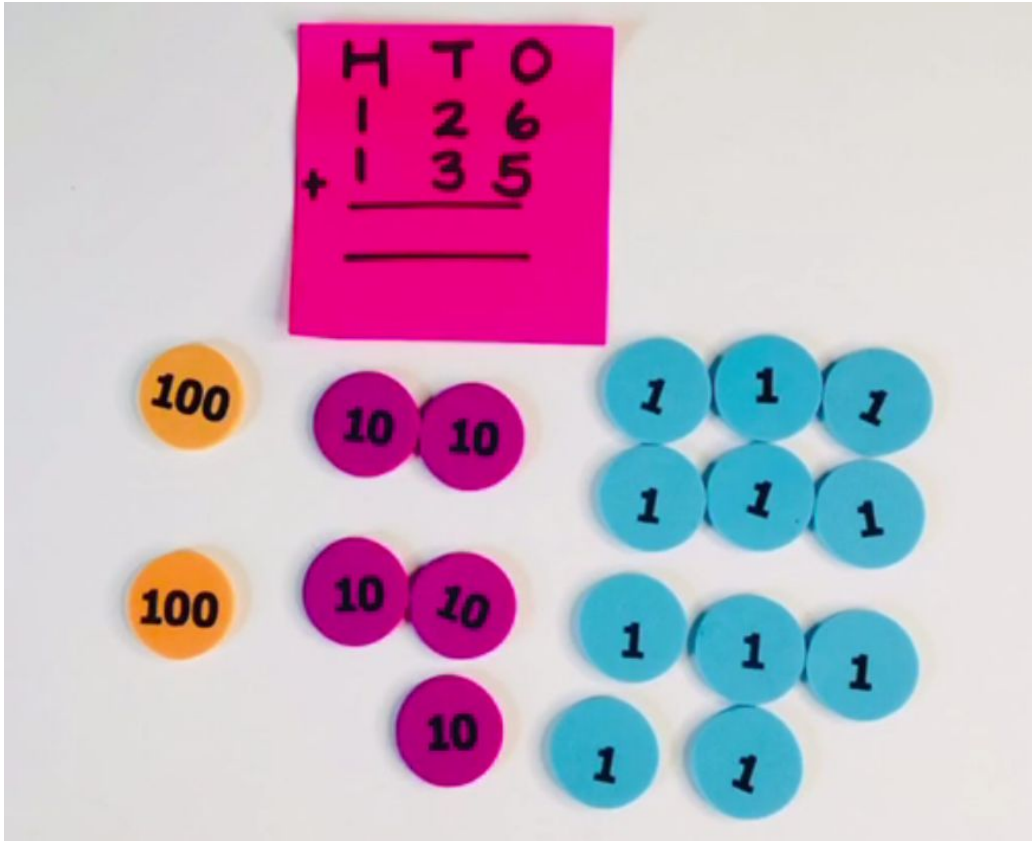
Then the hundreds - say it then record it.

Only towards the end of year 3 do we move towards the compact method - secure in their understanding.

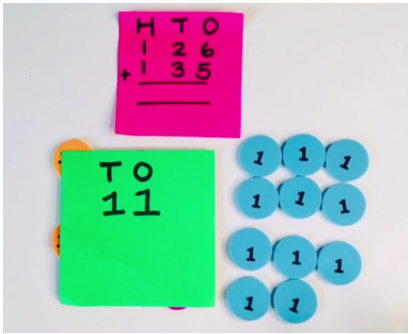
Begin with the partitioned/expanded method



Move onto the formal column method and progress to carrying



Representing what actually happens in the maths.



Are the children secure in their place value knowledge? How many ones, tens and hundreds are there?

Calculation policy

Y4

- Continue with columnar addition.

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

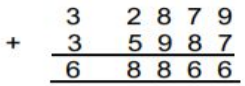
- Estimate and use inverse operations to check answers to a calculation.
- Add money using both £ and pence in practical contexts.

Addition with four digit numbers- 1s, 10s, 100s and 1000s

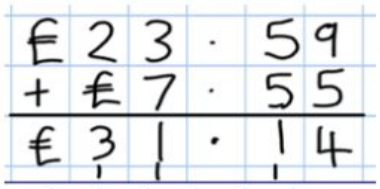
Calculation policy: addition with larger numbers

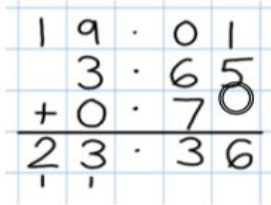
Y5

- Continue to use columnar addition, adding numbers with more than 4 digits.



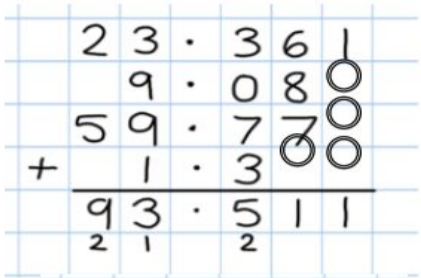
- Addition of money and decimals.

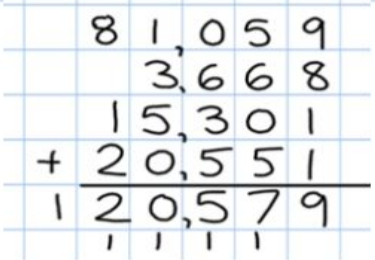




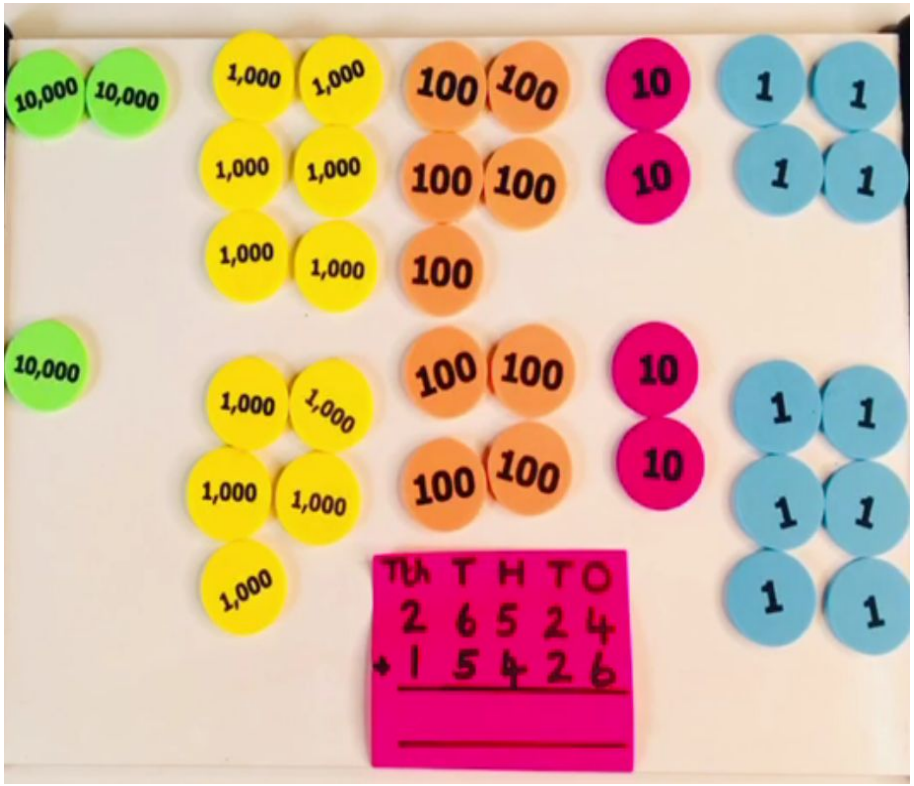
Y6

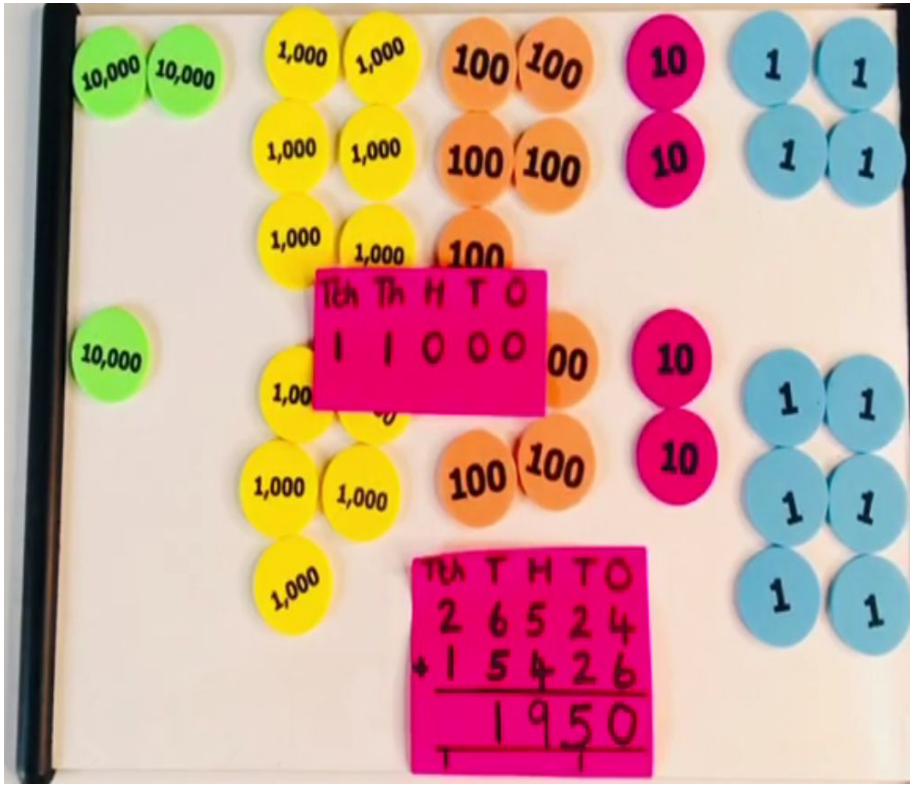
- Add several numbers of increasing complexity using columnar addition.



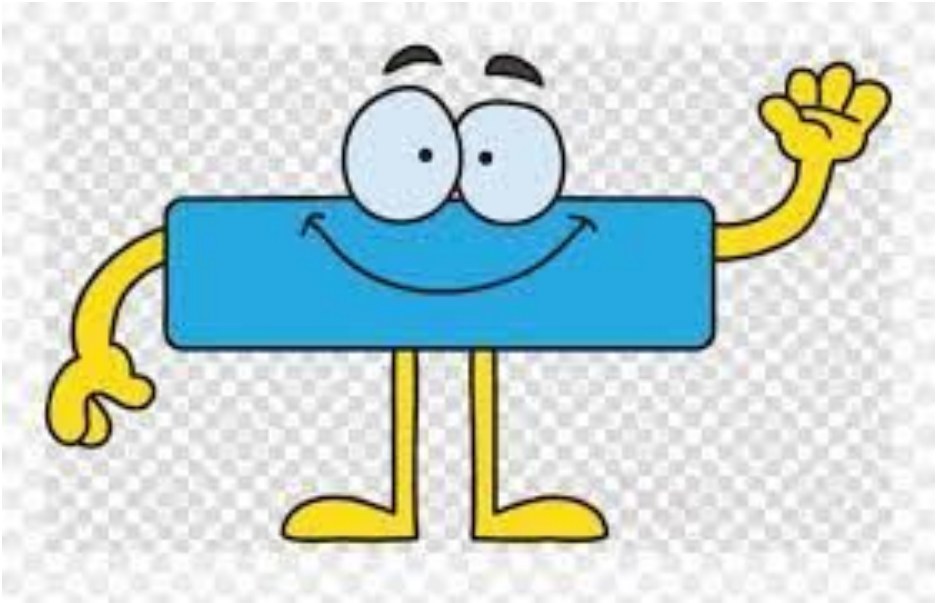


Passionate about understanding - Year 5 and 6





Subtraction in KS2



Calculation policy

Expanded method using partitioning.

Move onto exchange in year 3.

We do not use the word borrow. It's not accurate and not a method we use anymore as it doesn't support understanding.

Y3

- Continue with vertical number line subtraction progressing to the expanded columnar subtraction method.

89-35 = 54

80 + 9
- 30 + 5
50 + 4 = **54**

- Introduce exchanging through the expanded columnar subtraction method.

72 - 47

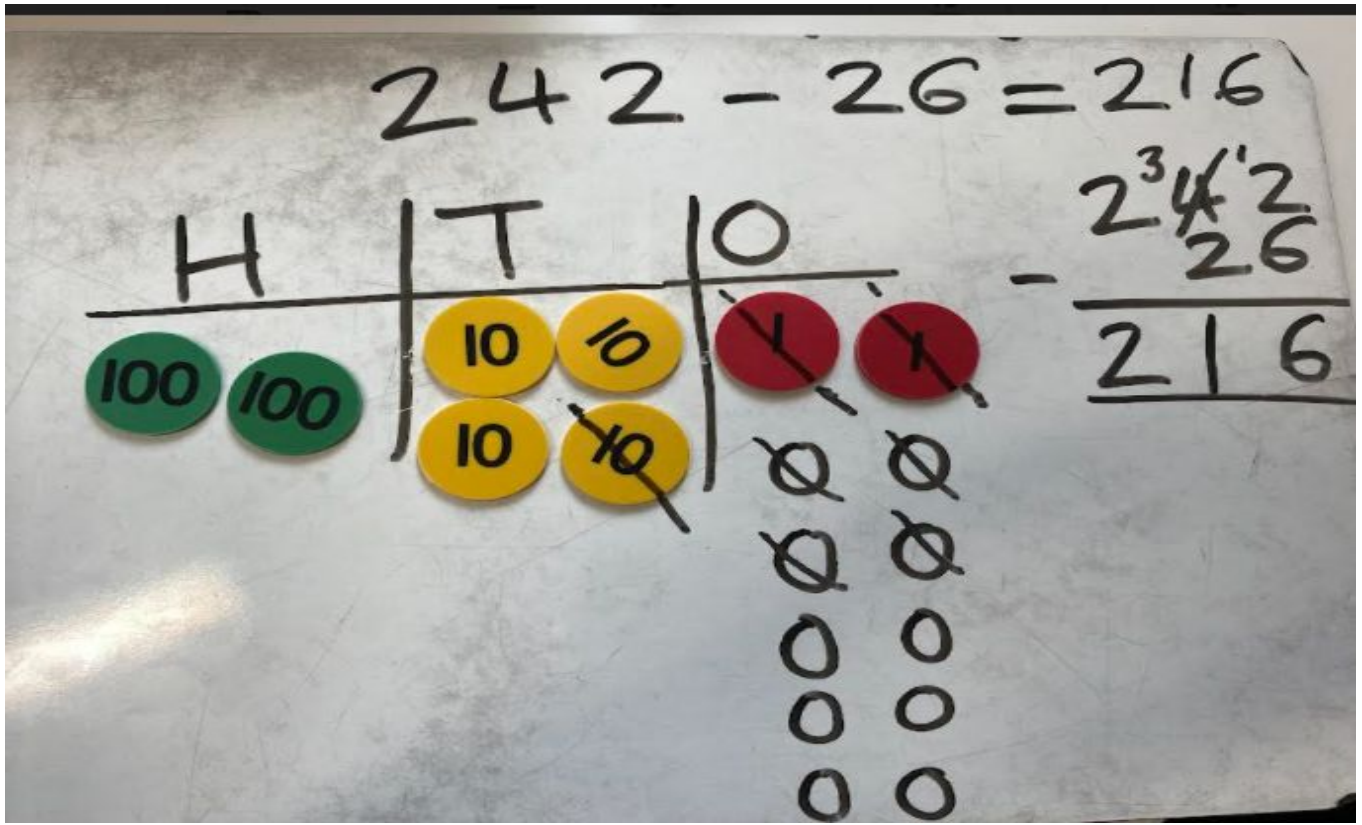
60 ~~70~~ + 12
- 40 + 7
20 + 5 = **25**

- Progressing on to compact columnar subtraction.

T O	H T O	T O
4 7	8 6 4	$^{4}\cancel{5}^{1}1$
- 2 3	- 6 2 1	- 3 6
2 4	2 4 3	1 5

- Emphasise value of digit, e.g. 4 tens subtract 2 tens = 2 tens. Use the correct language for subtraction i.e. exchange rather than borrow.
- Subtract amounts of money to give change.

Exchange



Calculation policy

Moving onto subtraction with 4 digit numbers.

Compact/formal written Method.

Estimate and use the inverse to check answers.

Y4

- Continue with partitioned columnar subtraction progressing to compact columnar subtraction.

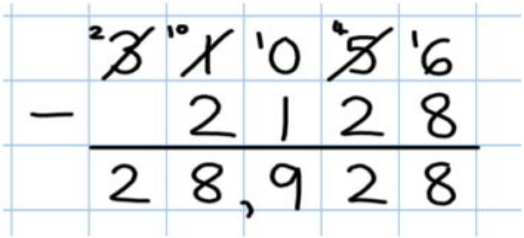
H T O	H T O	H T O	Th H T O
$^{3}\cancel{4}\,^{1}3\ 7$	$^{3}\cancel{4}\,^{12}\cancel{3}\,^{1}2$	$^{5}\cancel{6}\,^{9}\cancel{1}\cancel{0}\,^{1}4$	$8\ ^{3}\cancel{4}\,^{11}\cancel{2}\,^{1}6$
$-\ 1\ 8\ 2$	$-\ 1\ \ 8\ 7$	$-\ \ 3\ \ 4\ \ 7$	$-\ 2\ 1\ 7\ 7$
$2\ 5\ 5$	$2\ \ 4\ 5$	$2\ \ 5\ \ 7$	$6\ 2\ 4\ 9$

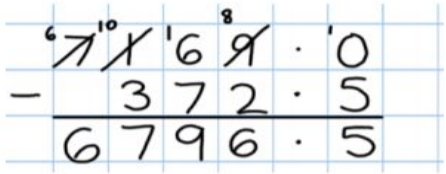
- Estimate and use inverse operations to check answers to a calculation.
- Subtract amounts of money using columnar method.

Calculation policy: subtraction with larger numbers

Y5

- Continue with compact columnar subtraction, including subtraction of decimals.

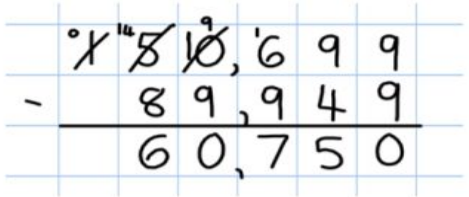


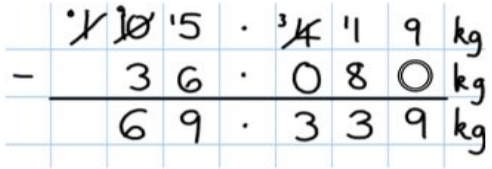


- Use rounding to check answers to calculations and to determine, in the context of a problem, levels of accuracy.

Y6

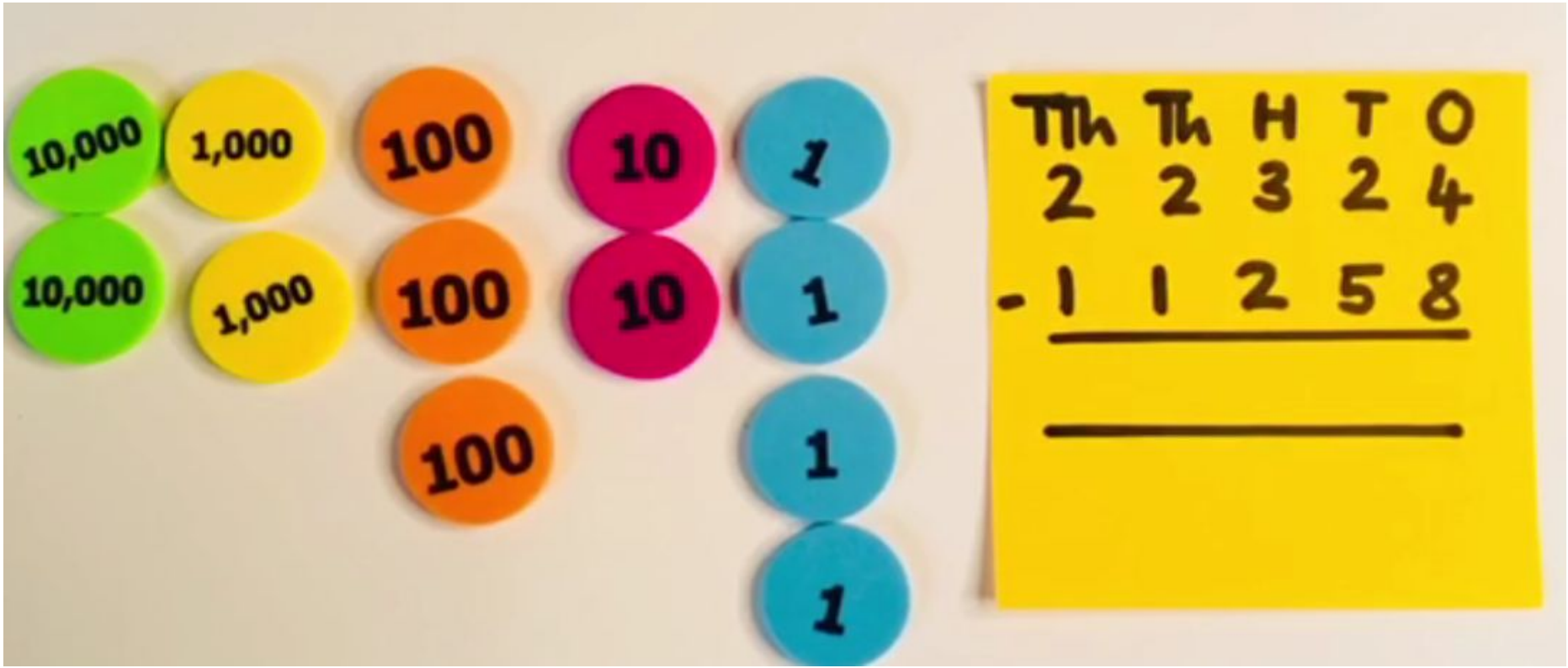
- Continue with compact columnar subtraction, including subtraction of decimals.





- Use estimation to check answers to calculations and to determine, in the context of a problem, levels of accuracy.

Supporting understanding using manipulatives

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- 1 1 2 5 8


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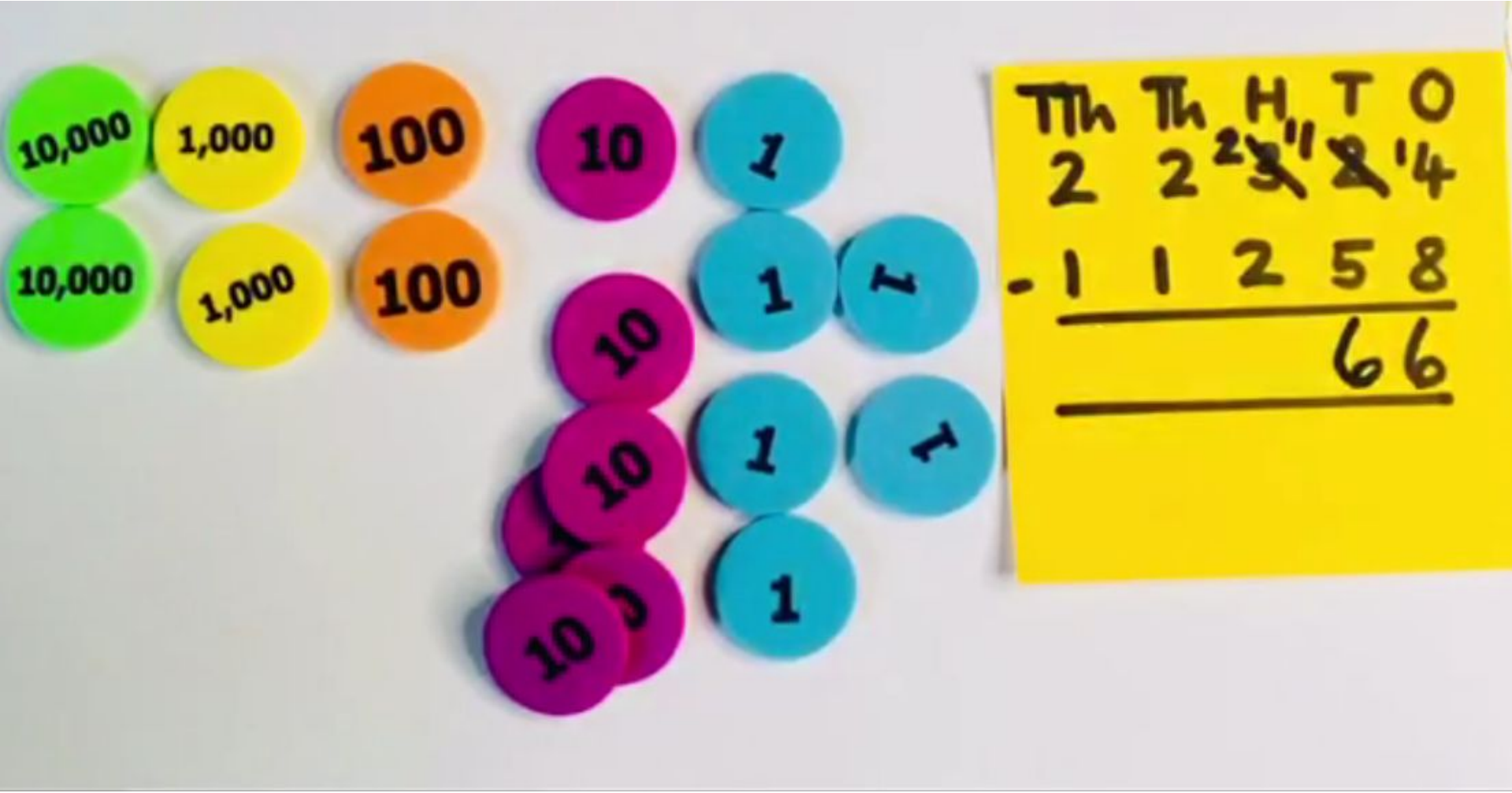
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- 1 1 2 5 8
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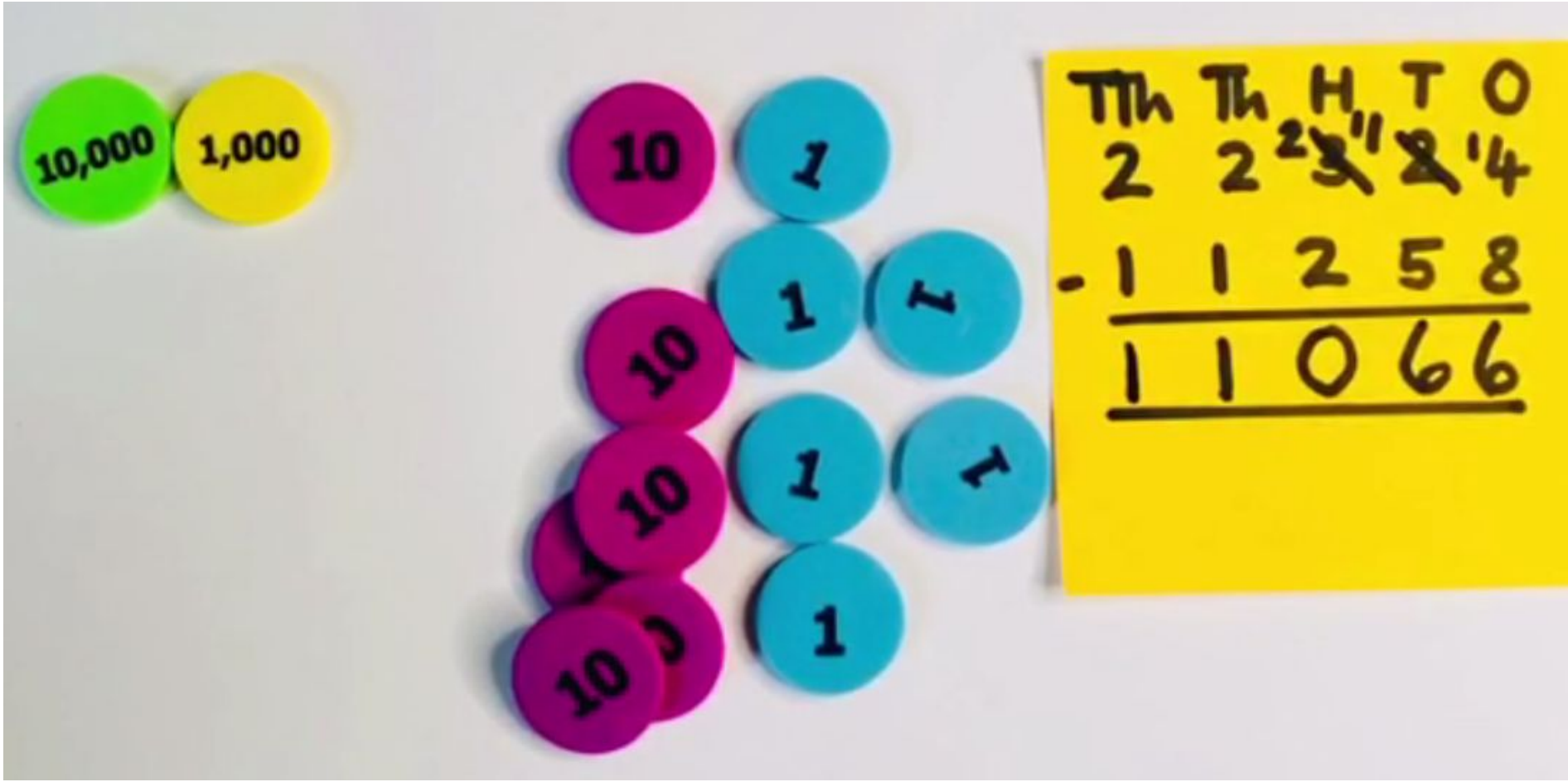
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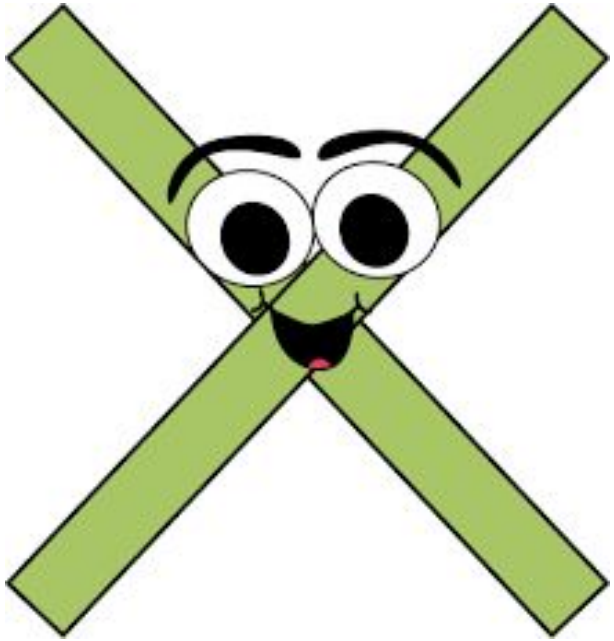
2 2 3 11 8 14
- 1 1 2 5 8
1 1 0 6 6

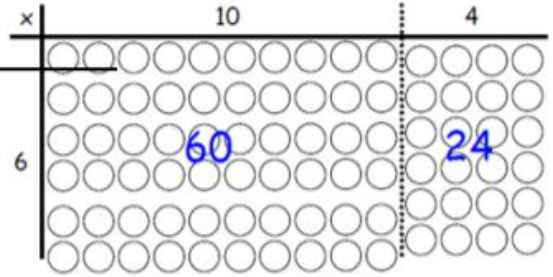
Multiplication in KS2



Y3

- Recall and use multiplication tables for 3, 4 and 8.
- Continue to use arrays and number lines/Cuisenaire rods for 3, 4 and 8 multiplication tables.
- Write and calculate mathematical statements for multiplication. Statements to include the multiplication tables that they know and 2 digit numbers x 1 digit numbers. Pupils use mental methods and progress to formal written methods.
- Introduce grid model.

X	10	4
6	60 + 24	= 84



- Progressing to expanded method of multiplication.

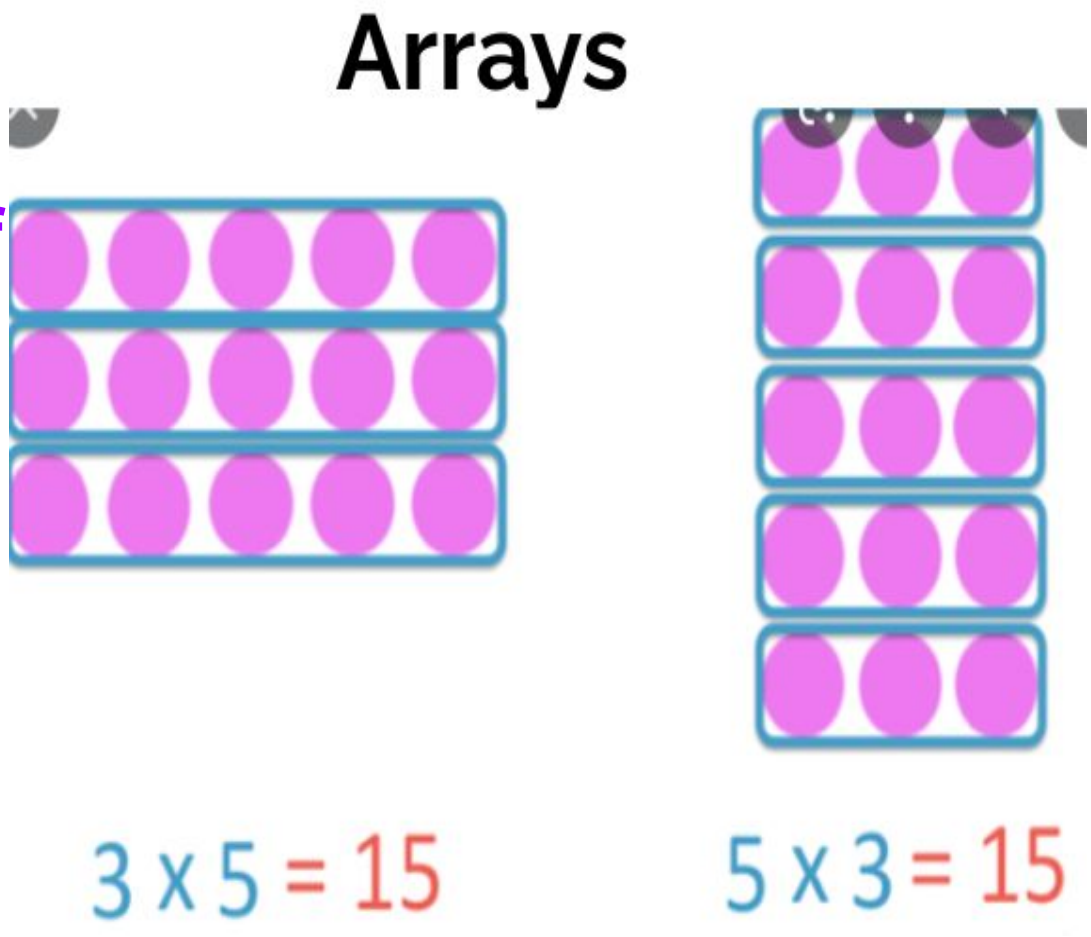
```
  T O
  1 4
x   5
  2 0  (5x4)
+ 5 0  (5x10)
  7 0
```

Year 3 children should know their 2, 5, 10 and 3, 4, and 8 times tables.

Use arrays to represent understanding .

Introduced to the grid method.

Visual representation of the commutative law



Grid method

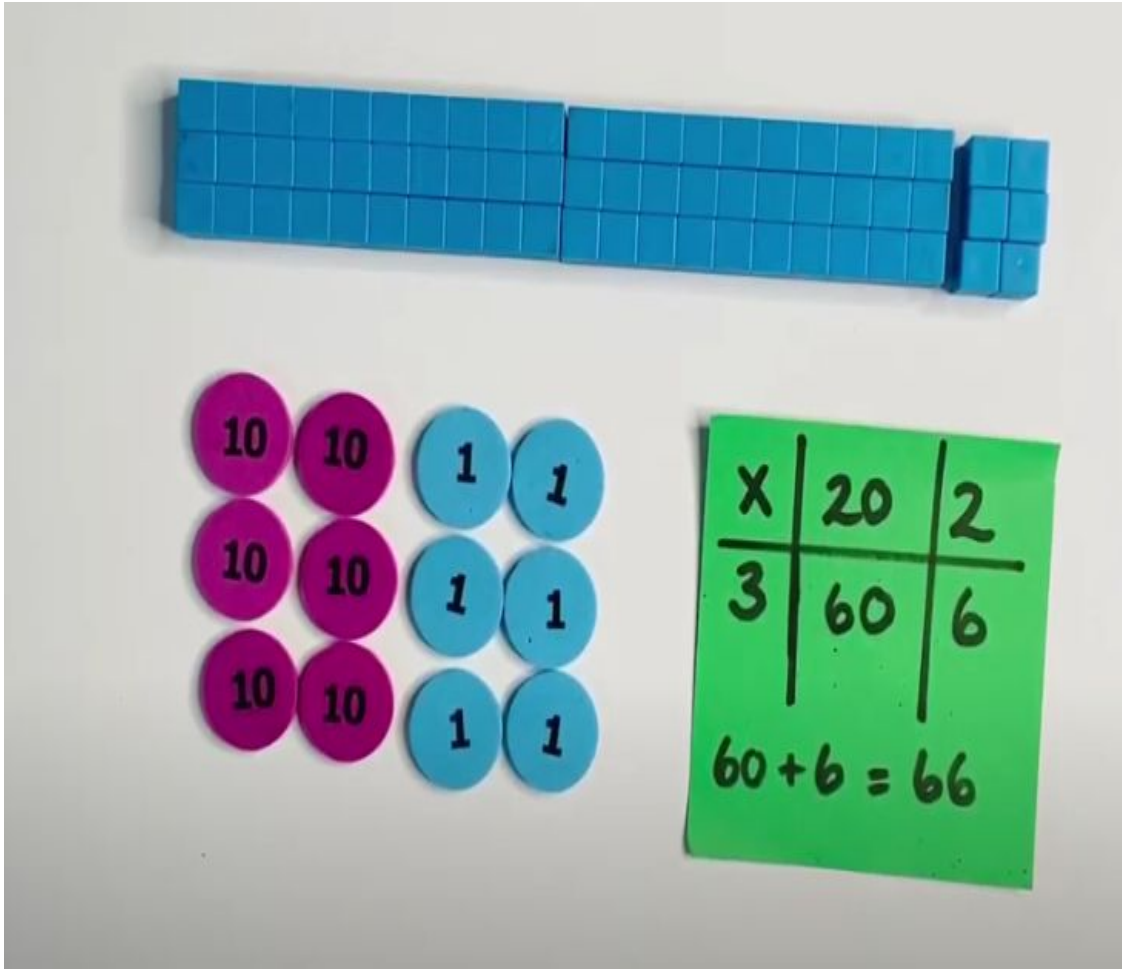
First partition the two digit number e.g. 22 is partitioned into 2 tens and 2 ones

Then multiply each by the multiplier- in this case is 3

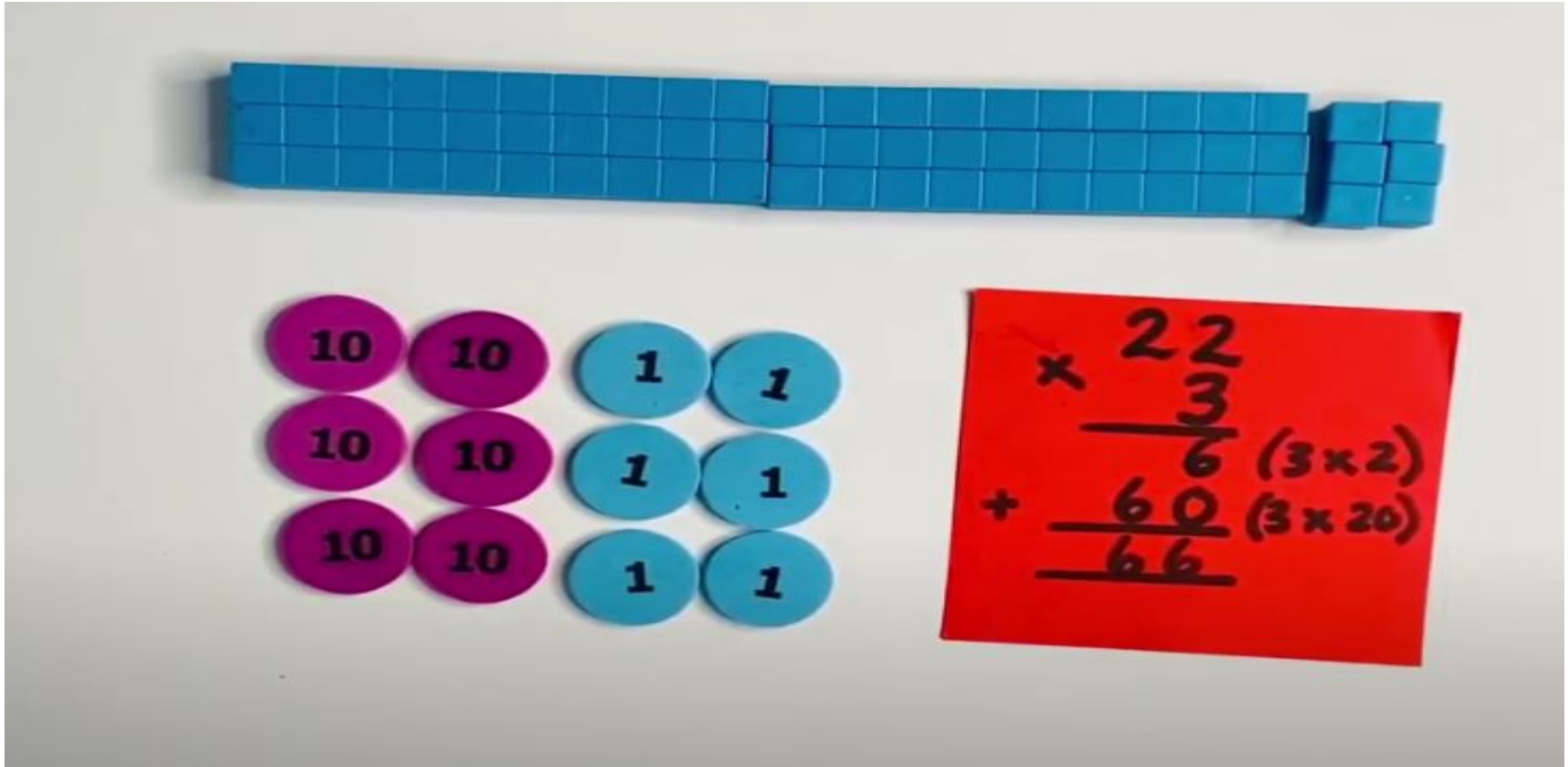
Finally add the totals.

Always start in my ones column (like I will when I get to the formal method).

If I know that 3 lots of 2 is 6, then I know that 30 x 2 = 60



Expanded method



Calculation policy

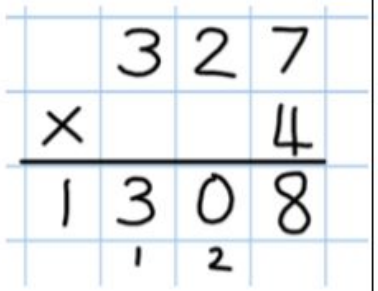
Year 4 children needs to know all of their multiplication tables up to 12 x 12.

Continue with grid and expanded method and move onto short multiplication.

Y4

- Recall and use multiplication tables up to 12x12 (Including multiplying by 0 and 1).
- Continue using grid method and expanded method as appropriate, progressing to short multiplication.

x	100	30	6
5	500	150	30



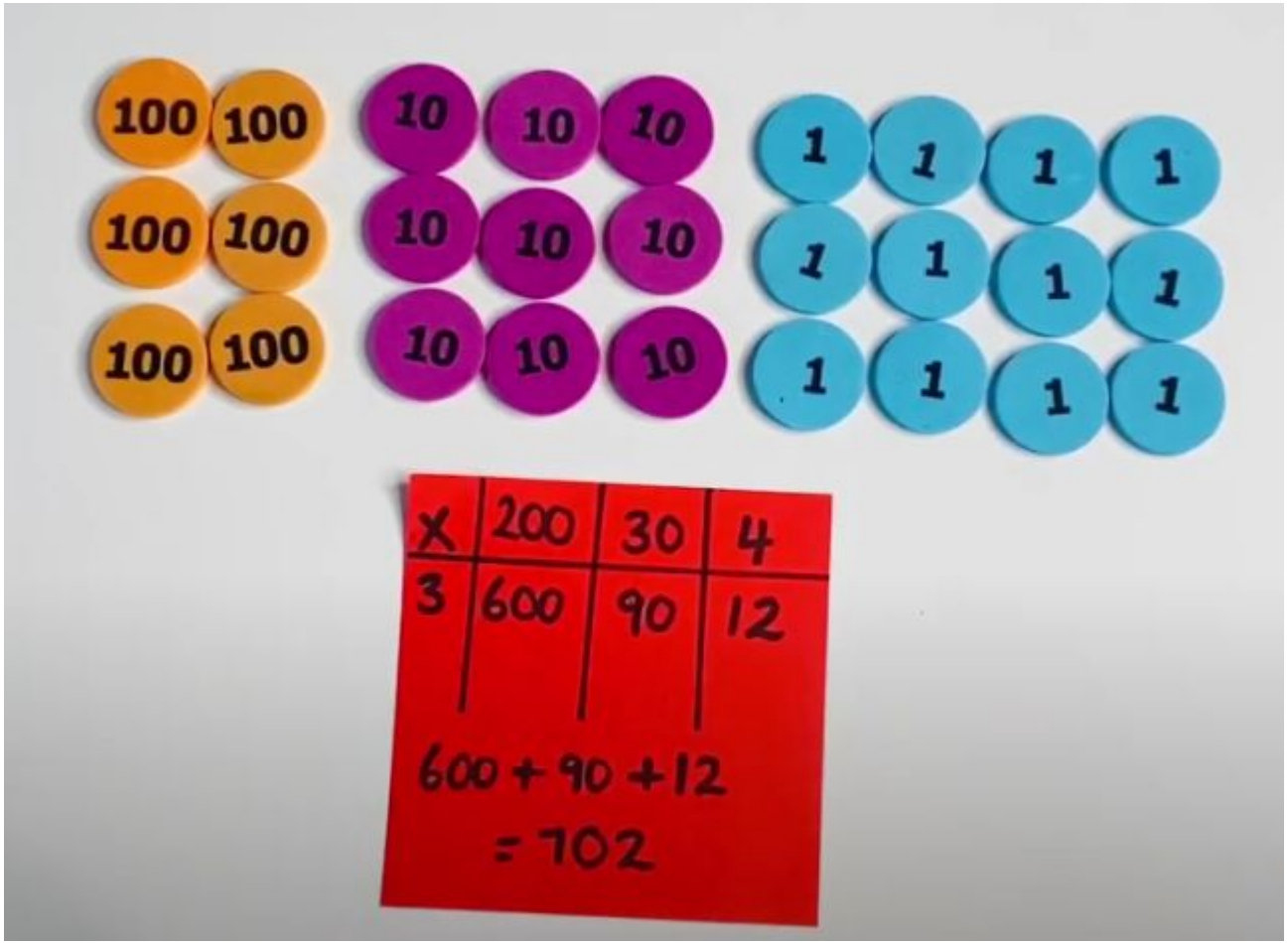
- Short Multiplication.

No carrying	Extra digit	Carrying	Zeros	Ext.
T O 3 2 x 3 9 6	H T O 5 1 x 2 1 0 2	H T O 3 8 x 7 2 6 6 5	H T O 2 0 2 x 4 8 0 8	H T O □ 5 □ x 4 6 1 2 2 1

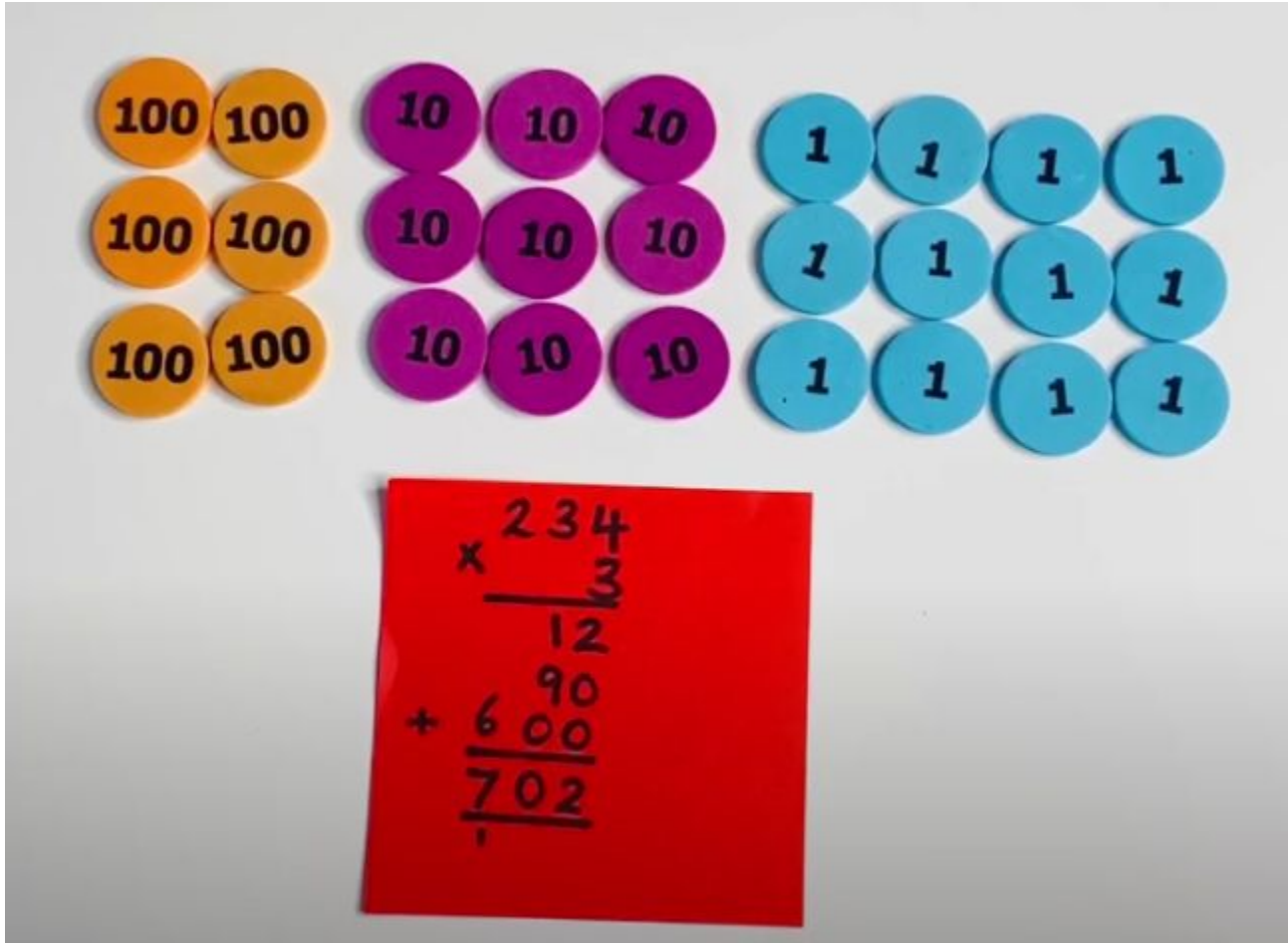
The goal – 6 seconds!

- Statutory Year 4 Times Tables Check
- Free website: https://mathsframe.co.uk/en/resources/resource/477/Multiplication-Tables-Check
- Children can see which ones were wrong
- Many creative ways to teach times tables to children: using a counting stick, chanting, repetition, pattern spotting, games, quizzes and more

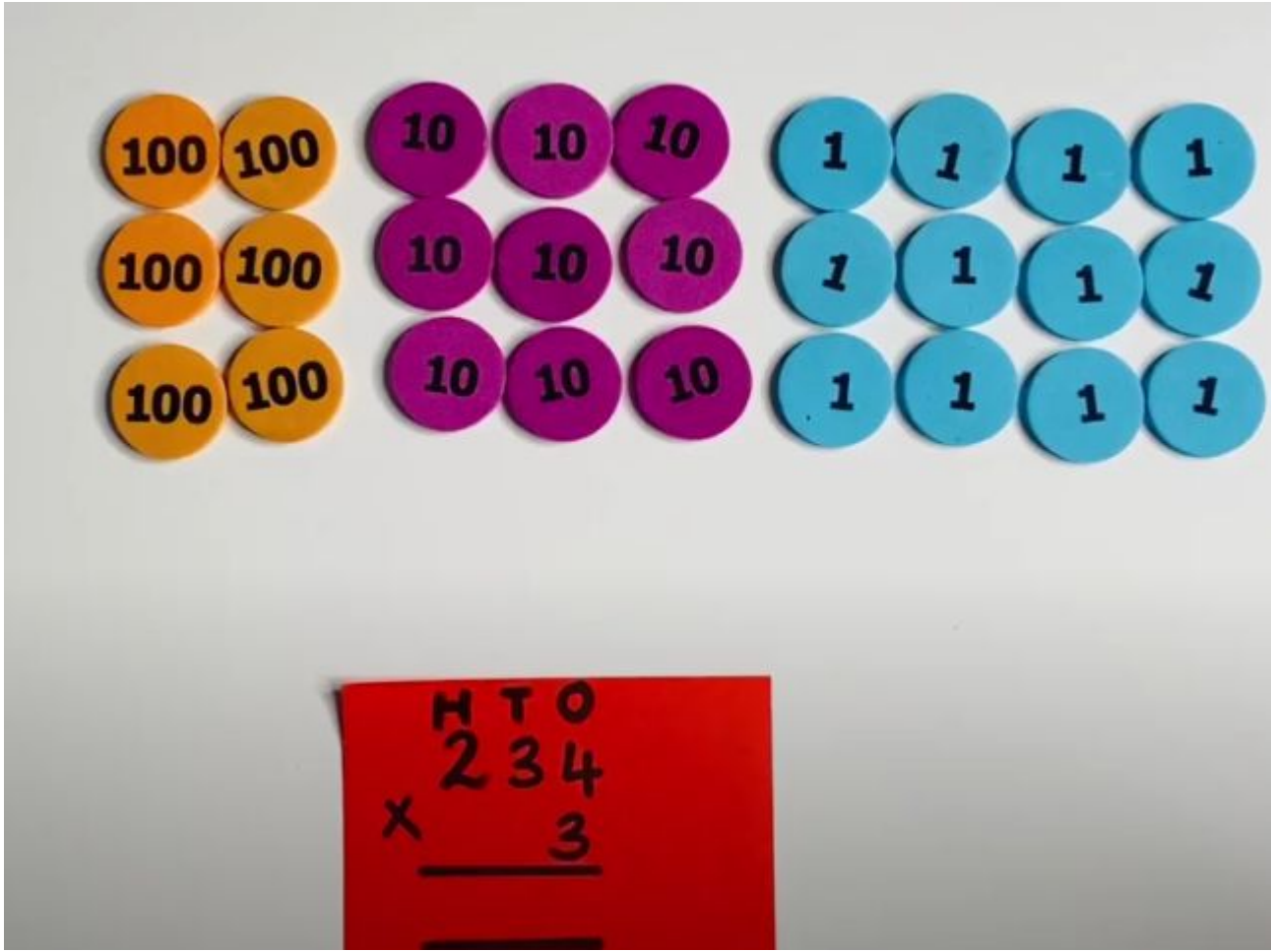
Grid method

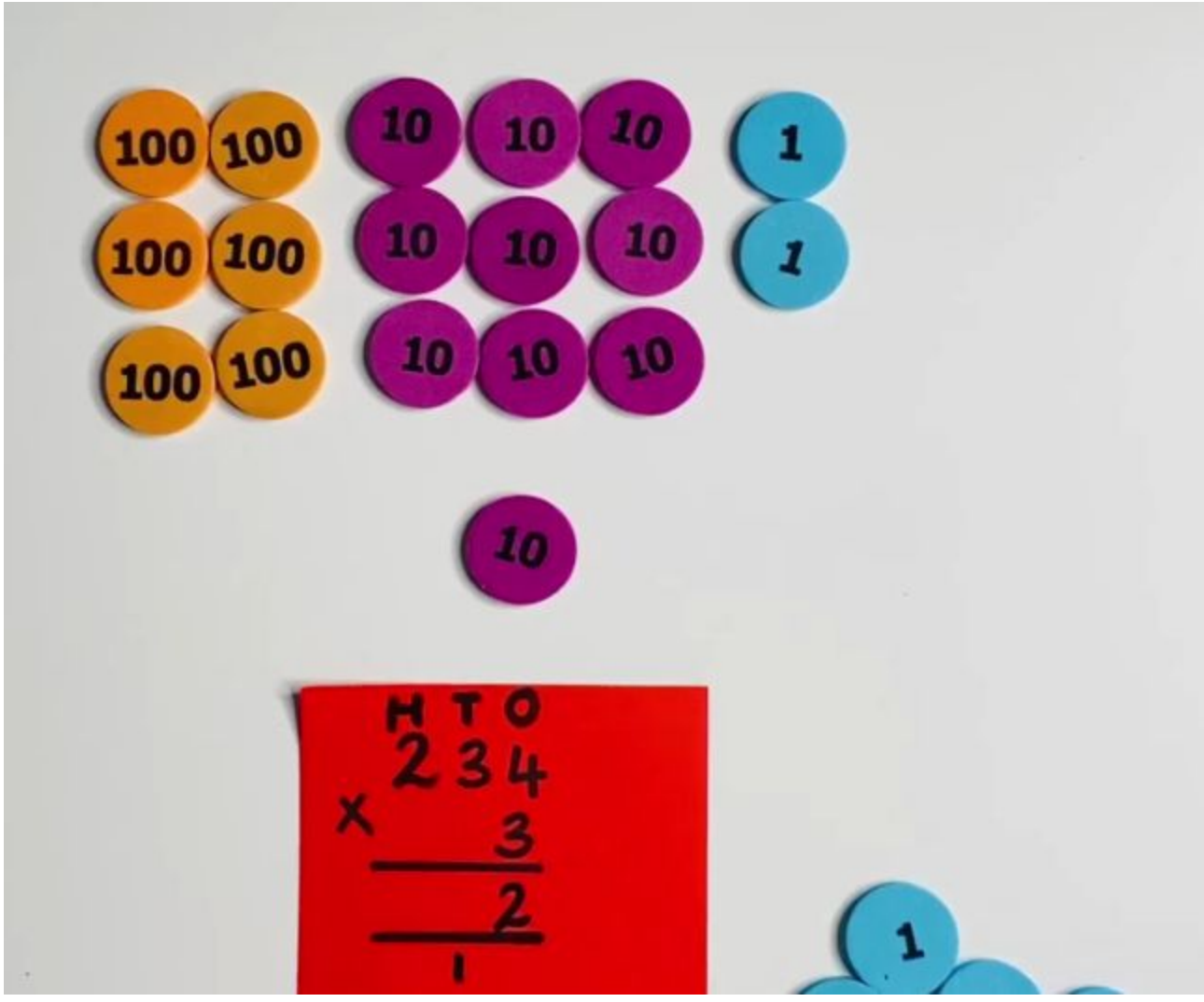

100 100
100 100
100 100
10 10 10
10 10 10
10 10 10
1 1 1 1
1 1 1 1
1 1 1 1
X 200 30 4
3 600 90 12
600 + 90 + 12
= 702

Expanded method



Regrouping- Short multiplication




100 100
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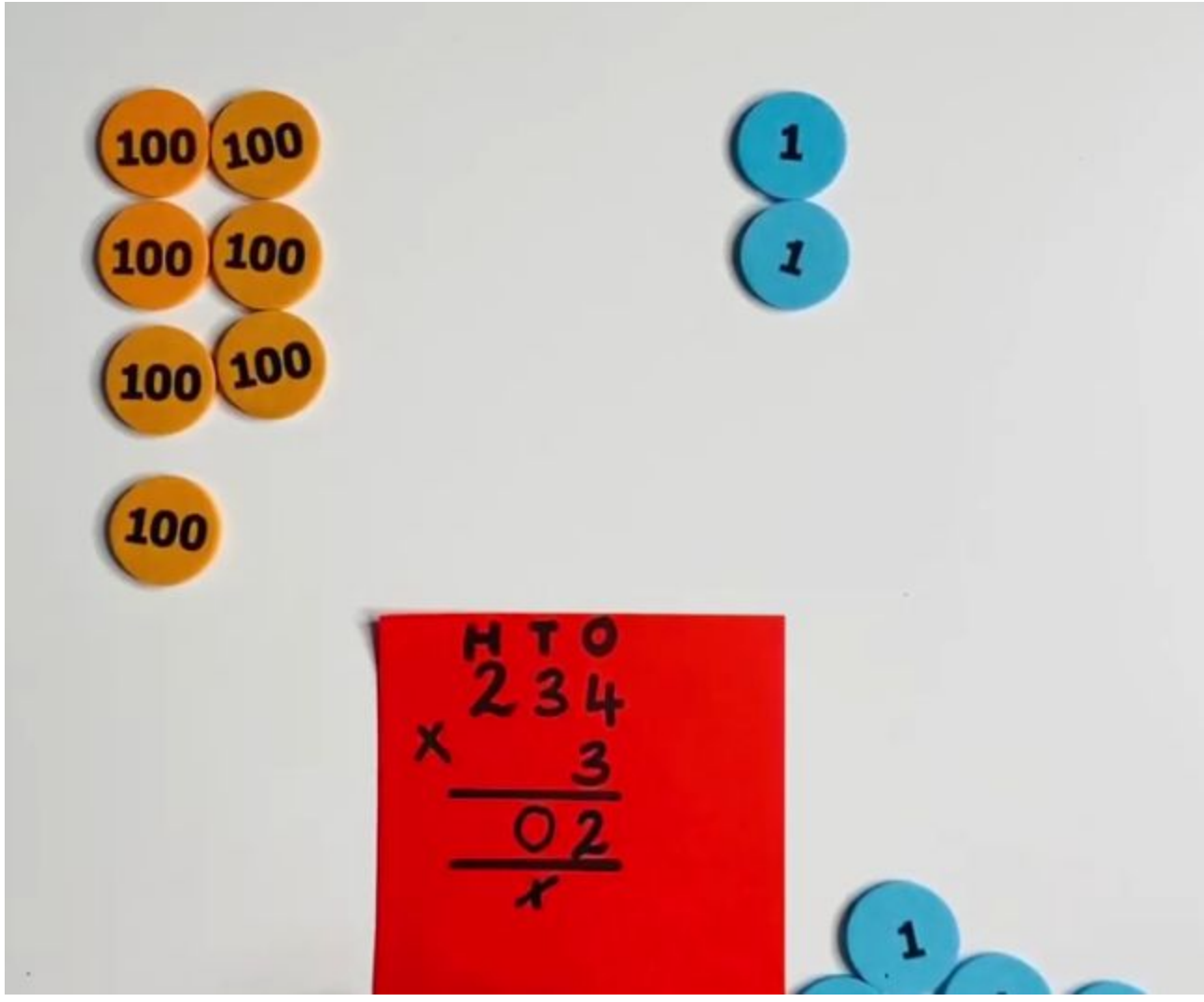
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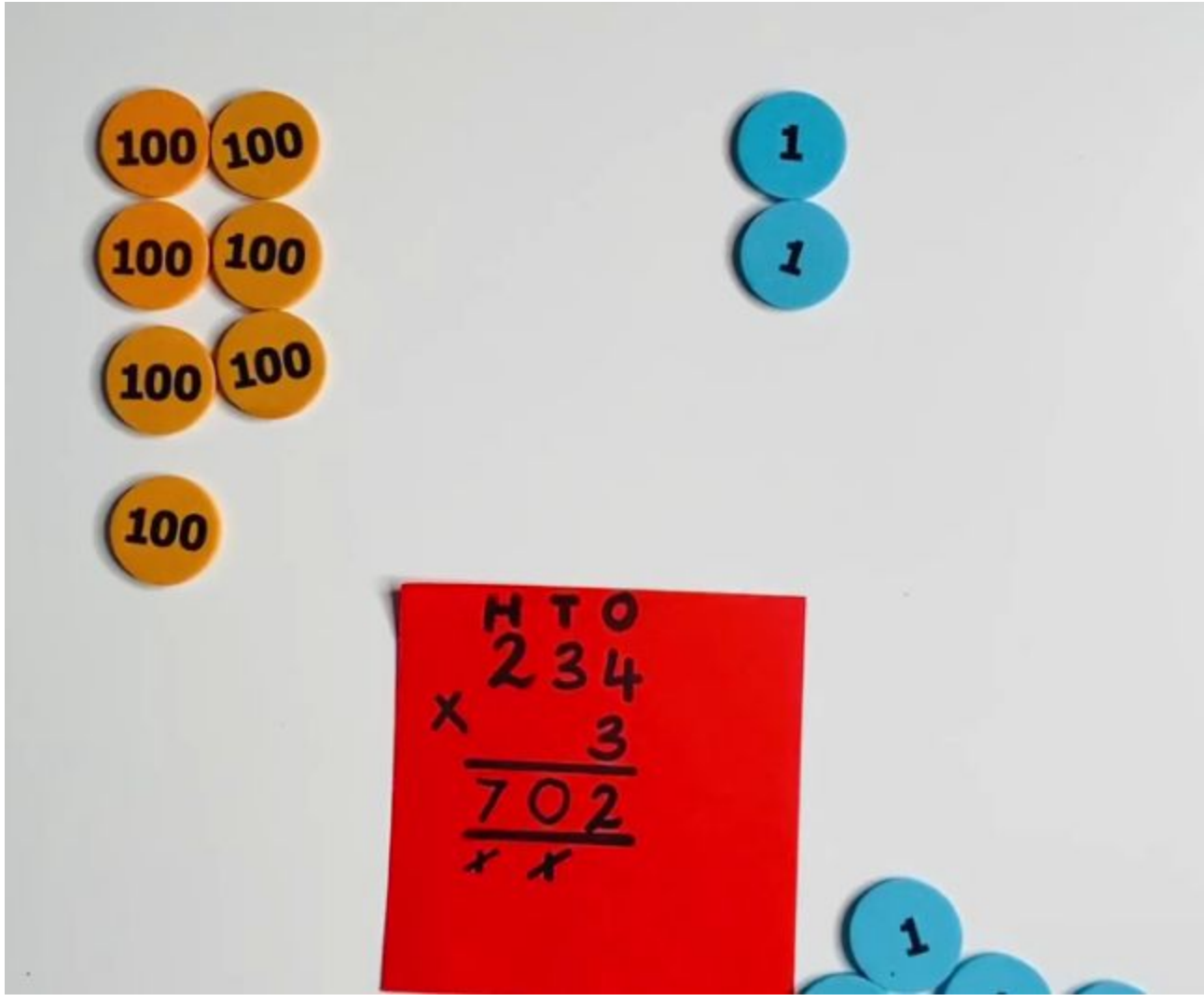
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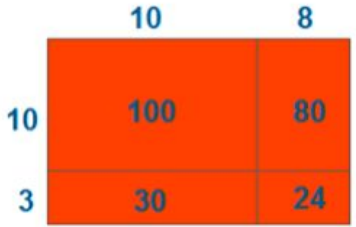
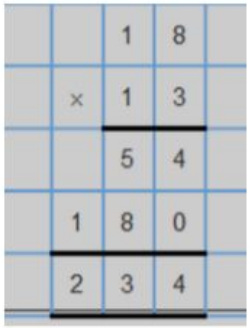
1
H T O
2 3 4
X 3
7 0 2
x x
1

Follows the same progression but moves onto long multiplication

Y5

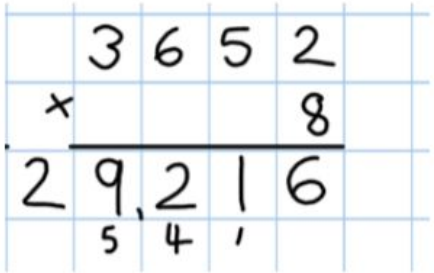
- Recall and use multiplication tables up to 12x12 (Including multiplying by 0 and 1).
- Continue to practise short multiplication.
- Use Grid Method to introduce long multiplication.

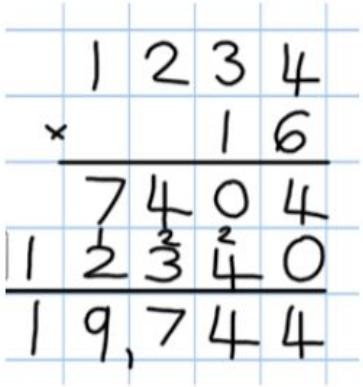




Y6

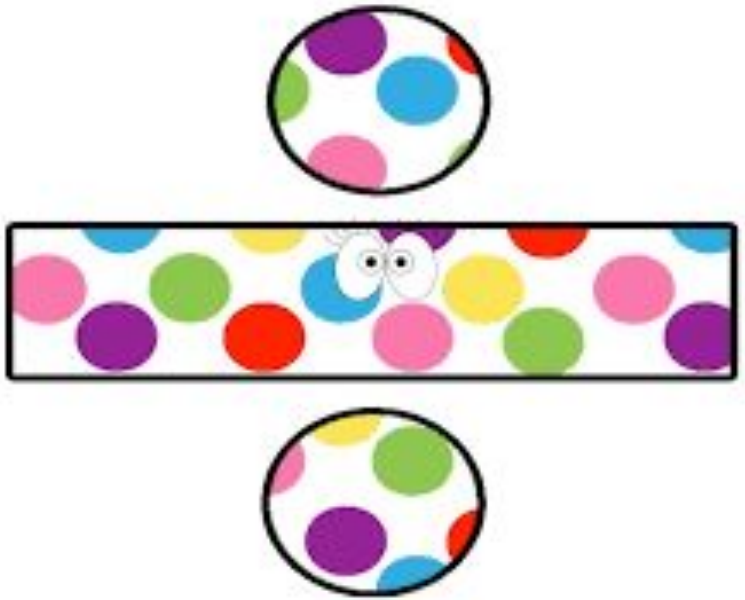
- Recall and use multiplication tables up to 12x12 (Including multiplying by 0 and 1).
- Continue to practise short multiplication.
- Continue to practise long multiplication.





- Multiply decimals using the grid method and progressing on to short multiplication.

Division in KS2

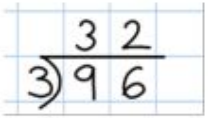


Y3

- Recall and use division facts for 3, 4, and 8 times tables.
- Continue with repeated subtraction on a vertical number line.
- Write and calculate mathematical statements for division using the tables they know.
- Introduce grouping method before short division, encourage children to estimate answers before attempting calculation. Create fact box to encourage efficient grouping e.g. not always groups of 10 - 1x, 2x, 5x, 10x, 20x, 50x, 100x.

```
  13
5) 65
 - 50   (5 x 10)
  15
 - 15   (5 x 3)
   0
```

- Introduce short division, with exact answers.



- Progressing to short division involving carrying, with exact answers.

National Curriculum requirements:
Division questions based on multiplication tables they know.

Divide 2 digits by 1 digit, progressing to formal written methods.

The National Curriculum statutory requirements for Year 3 and the use of written methods are not clear therefore our guidance for Year 3 has been based on the skills required to access Year 4 statutory requirements.

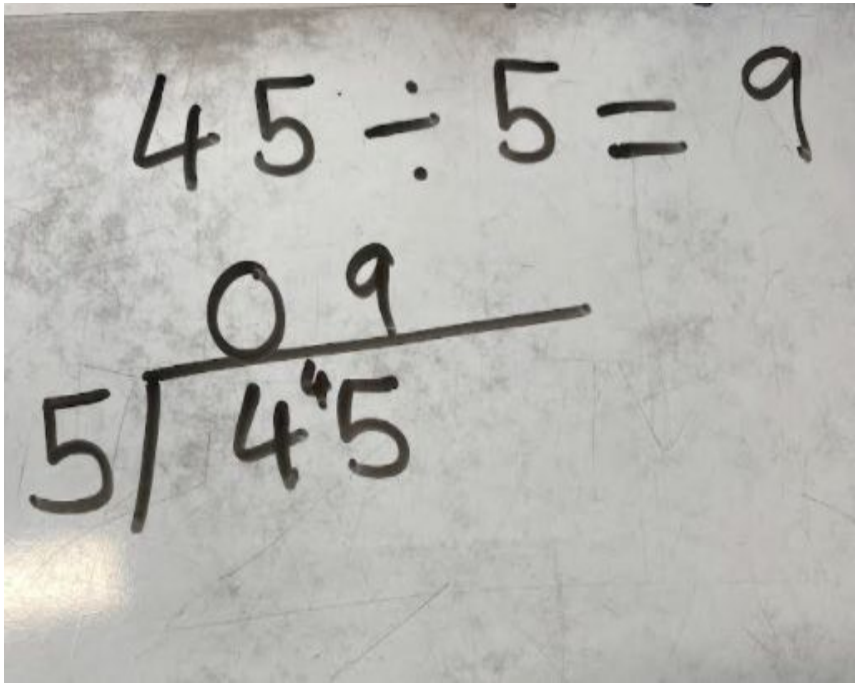
Division facts for the 3, 4 and 8 times tables.

Dividing 2 digits by a 1 digit number.

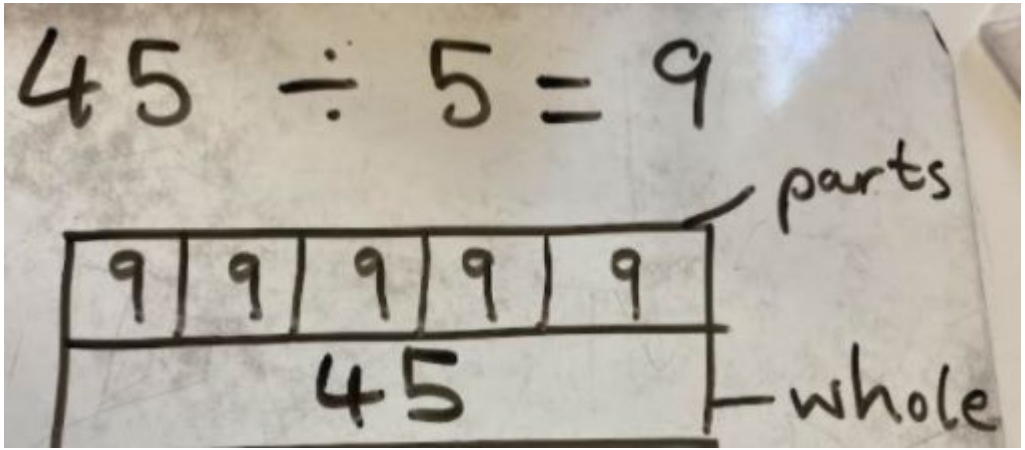
Introduce short division.

No remainders, only carrying!

Short division

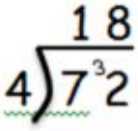


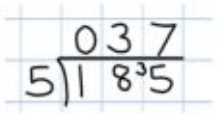
Bar model representation

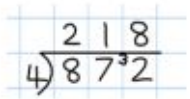


Y4

- Recall and use all division facts for all tables up to 12 (Including dividing by 1).
- Continue with short division method.







- Progressing to short division with remainders.

204 4)816	141 r1 3)424

National Curriculum requirements:
Divide 2 digits by 1 digit and 3 digits by 1 digit becoming fluent with formal written method of short division with exact answers and progressing to remainders.

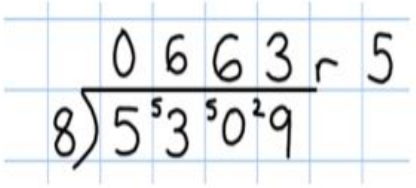
The National Curriculum statutory requirements for Year 4 and the use of written methods are not clear therefore our guidance for Year 4 has been based on the skills required to access Year 5 statutory requirements.

Division facts for all tables up to 12 x 12.

Progress to short division with remainders.

Y5

- Consolidate the use of the formal written method of short division.



National Curriculum requirements:
Divide 2 digits by 1 digit.
Divide 3 digits by 1 digit.
Divide 4 digits by 1 digit.

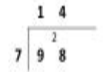
Children interpret the remainders appropriately for the context.
e.g. as fractions, decimals or by rounding
98÷4 = 98/4 = 24r2 = 24 ½ = 24.5 rounded to 25

Divide whole numbers and those involving decimals by 10, 100, 1000.

Y6

- Consolidate short division.
- Children should be able to interpret remainders as whole number remainders, fractions or by rounding, as appropriate for the context.

98 ÷ 7 becomes



- Answer: 14

432 ÷ 5 becomes

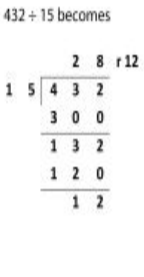
Answer: 86 remainder 2

496 ÷ 11 becomes

Answer: $45\frac{1}{11}$

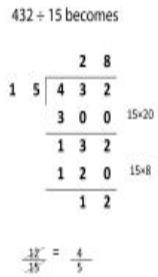
- Introduce long division.

432 ÷ 15 becomes



Answer: 28 remainder 12

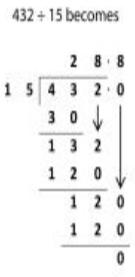
432 ÷ 15 becomes



$\frac{12}{15} = \frac{4}{5}$

Answer: $28\frac{4}{5}$

432 ÷ 15 becomes



Answer: 28·8

N.B: The above examples are taken from the National Curriculum for Mathematics appendix.

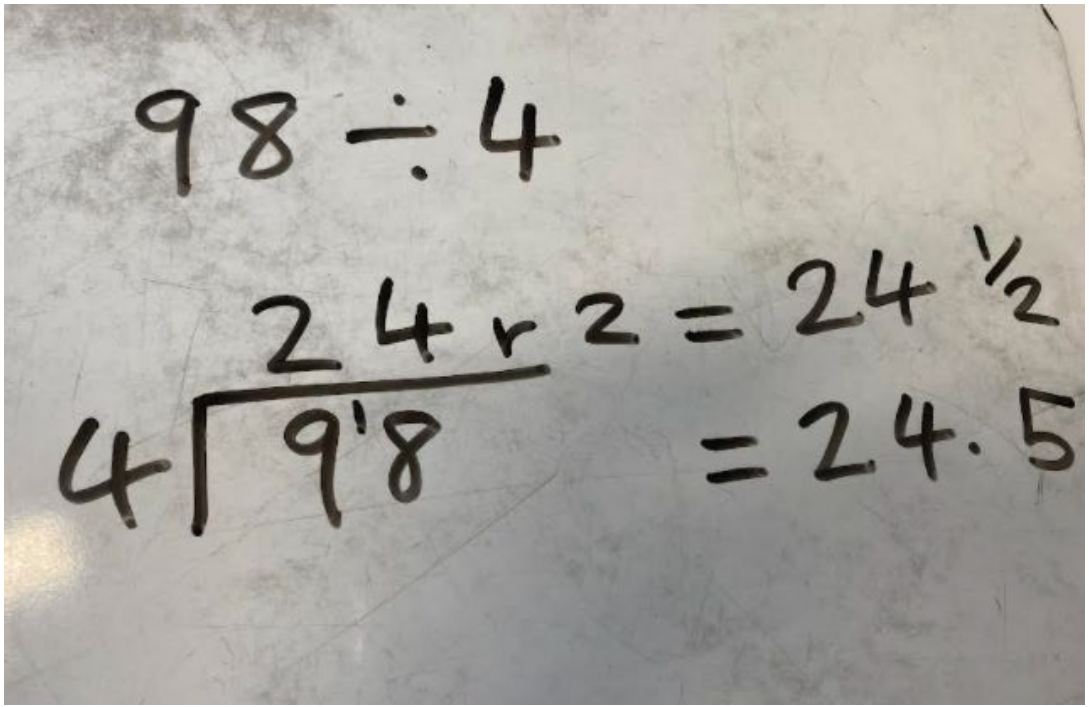
National Curriculum requirements:
Divide numbers up to 4 digits by a 2 digit number using the formal written method of short division where appropriate.

Divide up to 4 digits by a 2 digits whole number using the formal written method of long division.

Children interpret remainders as fractions and decimals.

Introduce long division in year 6.

Representing remainders as fractions and decimals



Manipulatives- concrete resources

Dienes

Multiplication grids

Place value counters

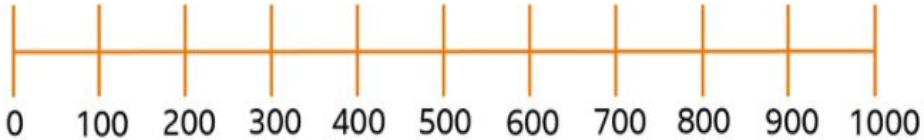
100 squares

Number lines

Coins

x	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

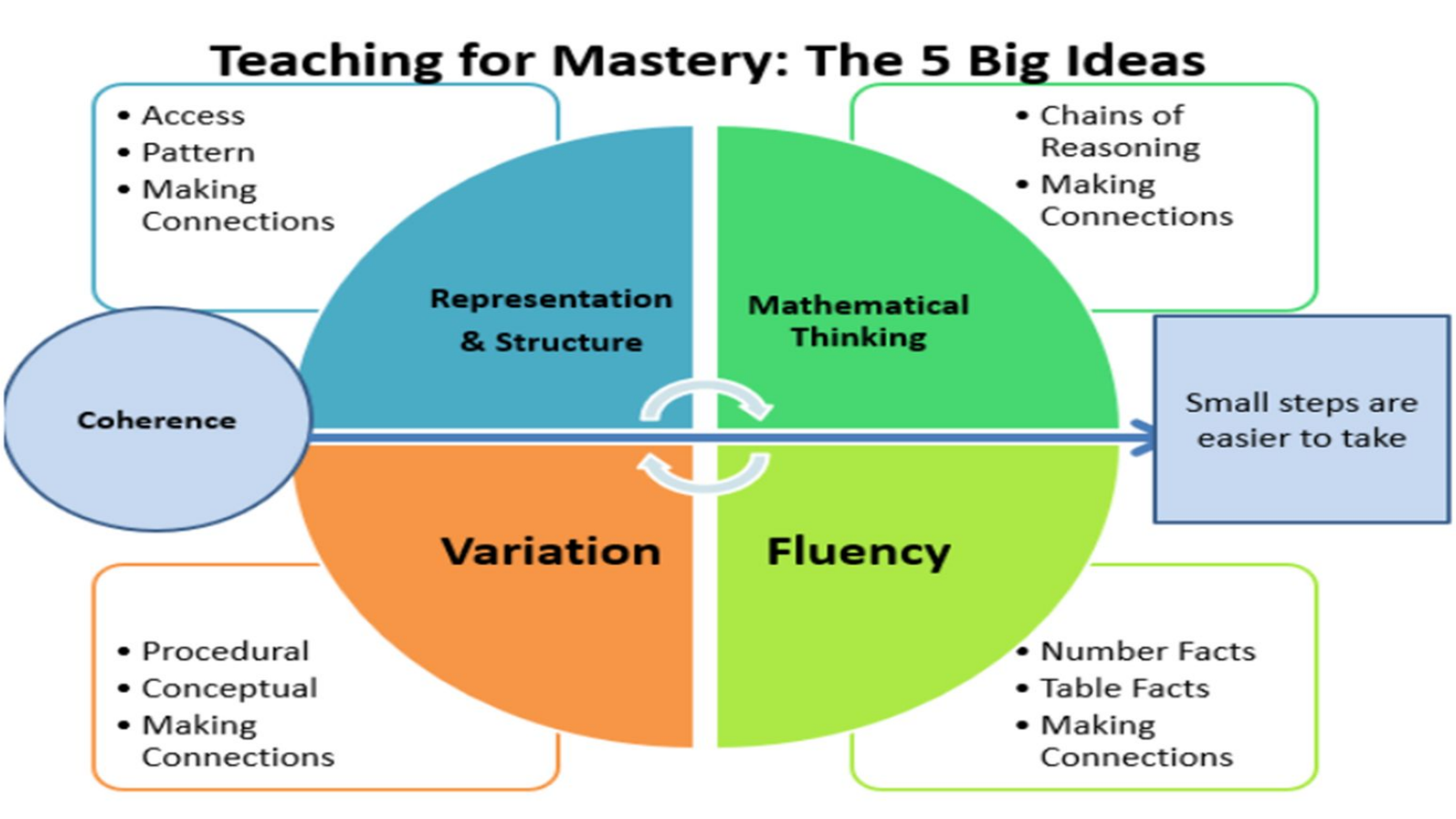
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



The Teaching for Mastery Approach

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
- I'm really good at it- painting a picture
- I can show someone else how to do it


Teaching for Mastery: The 5 Big Ideas
• 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

Making generalisations

- If you change the position of the numbers in a multiplication calculation, the answer will always stay the same.

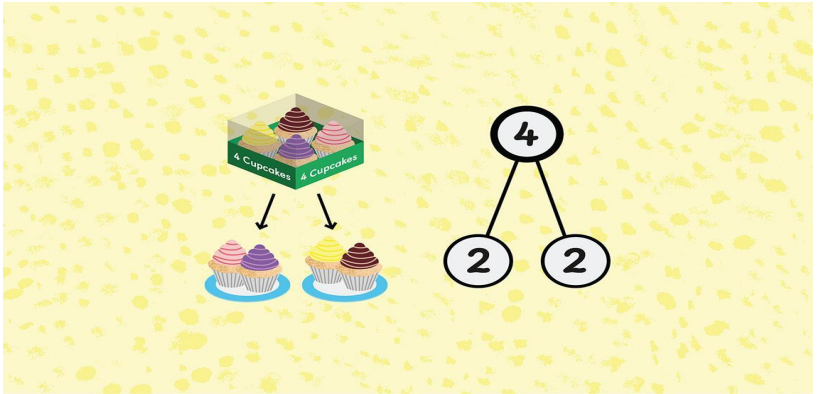
E.g. 4 x 5= 20 and 5 x 4 = 20 (commutativity)

- All even numbers end in 0, 2, 4, 6, 8

- When counting in 10s, the ones digit always stays the same but tens digit changes

Representation and Structure

- Representations are used in lessons to expose the mathematical structure being taught.
- In essence representation refers to the wide variety of ways to capture an abstract concept or relationship.



Multiple representations of the same number.

Number	Number word
47	Forty seven
Draw it	**Expanded form**
Tens | Ones |||| |	40 + 7 = 47 7 + 40 = 47

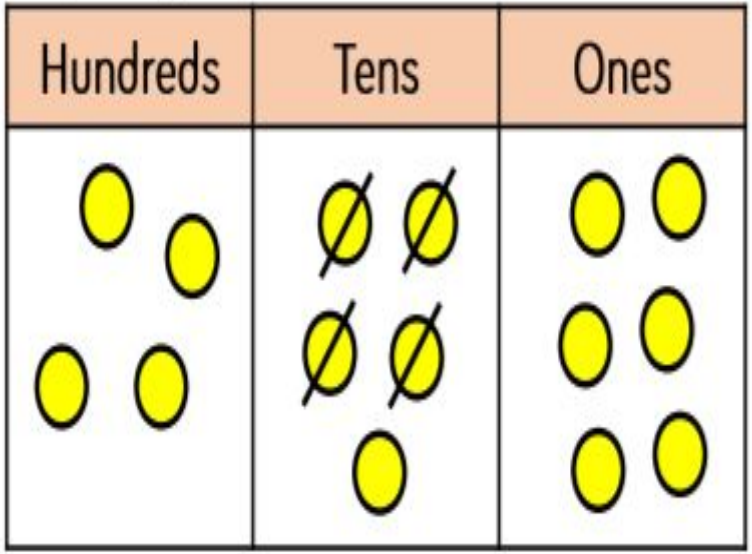
Mathematical Thinking

- If taught ideas are to be understood deeply, they must not merely be passively received but must be worked on by the pupil: thought about, reasoned with and discussed with others.
- We provide lots of opportunities for peer and collaborative discussions in our daily maths lessons.
- Problem solving and reasoning opportunities in every session to embed a depth of learning

Reasoning: Spotting mistakes and misconceptionsh

Alex thinks the chart shows 456 – 4

Do you agree?



Rosie completes this subtraction incorrectly.

$$\begin{array}{r} 28701 \\ -\ 7621 \\ \hline 21180 \\ \hline \end{array}$$

Explain the mistake to Rosie and correct it for her.

Reasoning: True or false?

True or False?

$49{,}999 - 19{,}999 = 50{,}000 - 20{,}000$

I did not need to use a written method to work this out.

Dora

Can you explain why Dora's method work?

Can you think of another example where this method could be used?

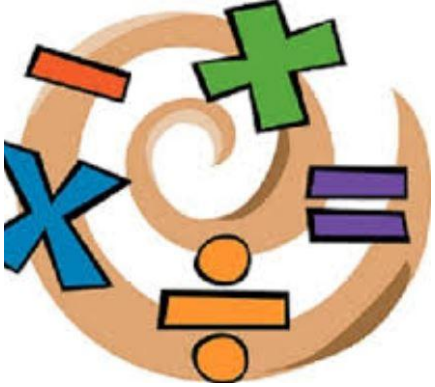
Reasoning: Always, sometimes or never true?

Always, sometimes, never

- When multiplying a two-digit number by a one-digit number, the product has 3 digits.
- When multiplying a two-digit number by 8 the product is odd.
- When multiplying a two-digit number by 7 you need to exchange.

Prove it.

Fluency



- Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics.
- Playing cards in class for times table practice
- Hit the button- Topmarks for quick fire number fact practice
- TT Rockstars- all KS2 classes set up- an exciting online resource for times table practice.
- Weekly times tables quizzes
- Number fact fluency work

Using known number facts: if we know this, what else do we know?

60 x 30 = 1800

600 x 300 = 180, 000

60 x 3 = 180

6 x 3 + 1 = 19

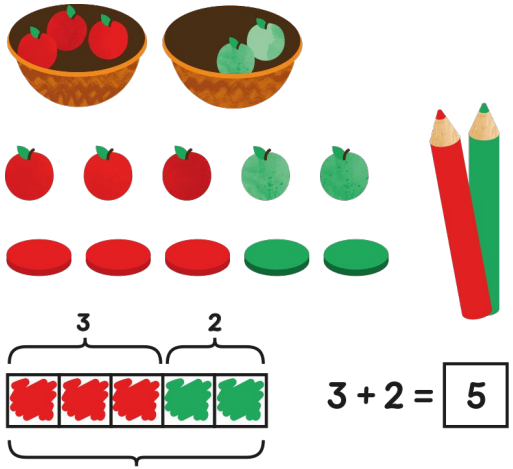
18 = 3 x 6

18 ÷ 3 = 6

6 = 18 ÷ 3

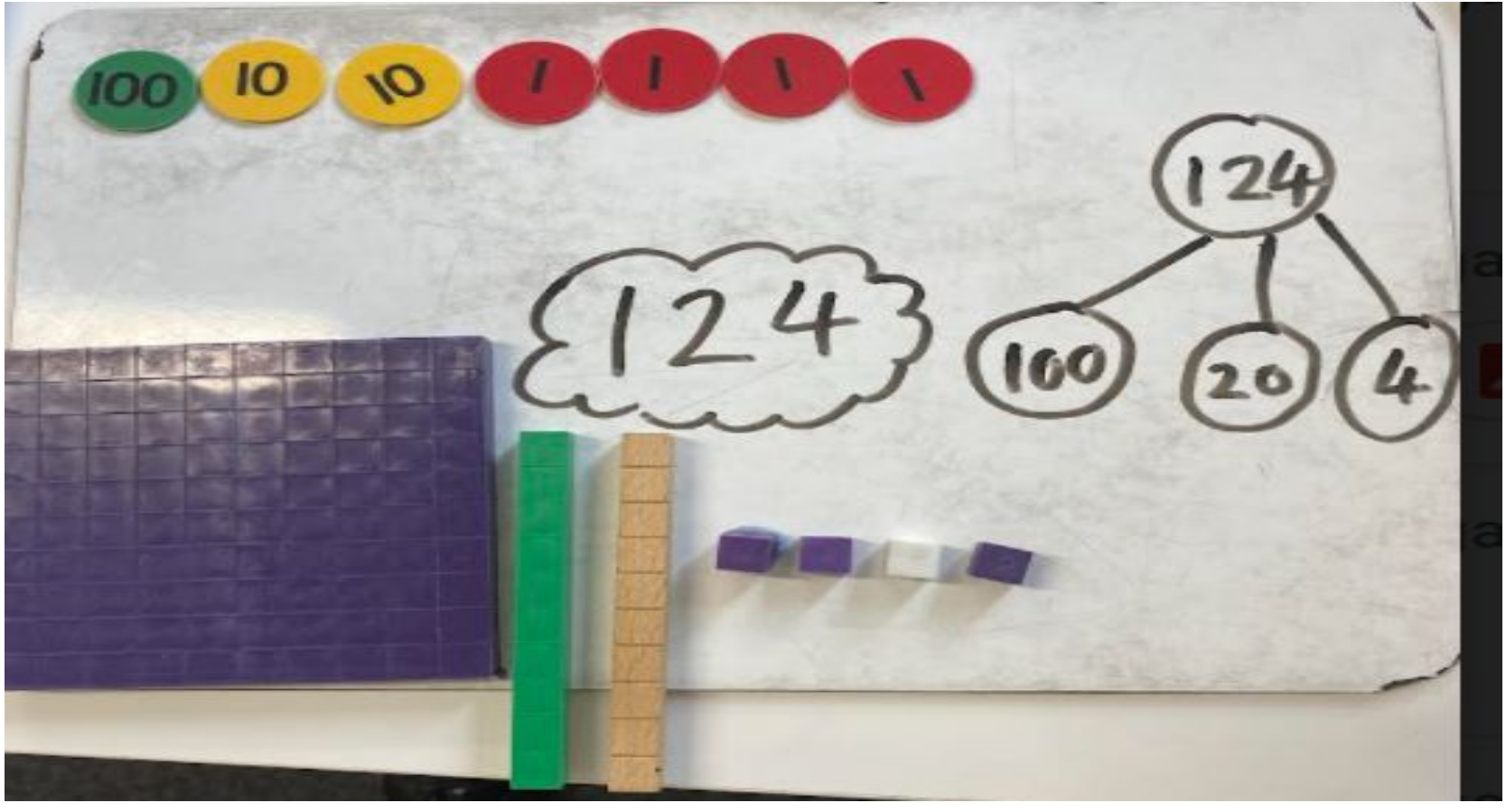
0.5 x 12 = 6

Conceptual variation



- This is about all about how the teacher represents the concept being taught
- An opportunity to work on different representations of the same mathematical idea.
- These multiple representations will 'showcase' to pupils the different conceptual ideas that underpin a mathematical idea.

Variation helps visualisation



Everyone Can!

At Grange Park we encourage children to develop a **growth mindset** by using these strategies:

- It's ok to get it wrong- mistakes are valuable opportunities to re think and understand more deeply. Spotting and sharing mistakes between teachers and pupils makes learning richer.
- Praising hard work- is a great motivator by focusing on effort rather than success. Children will be more willing to try harder and take risks.
- Mind your language- the language we (teachers and parents/carers) use around learners has a profound effect on their mindsets. Make a habit of using growth phrases like 'everyone can', 'mistakes can help you learn', 'just try for a little longer' and the key of them all- 'yet'. 'I just cannot solve this yet!'

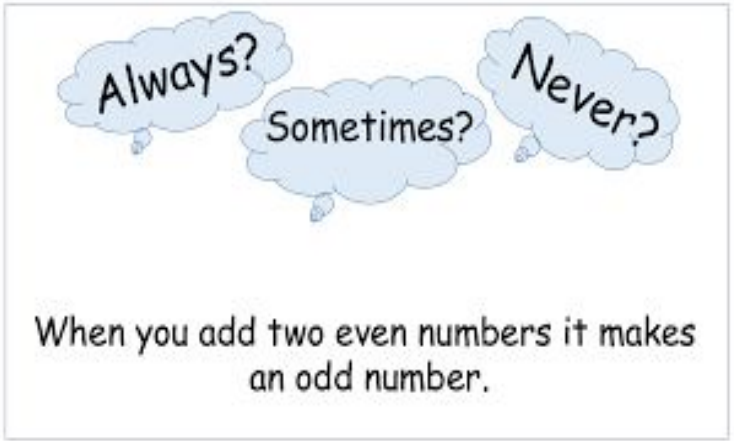
Maths Talk

- **Key Vocabulary:** Discussing essential vocabulary
- **Full sentences**: Teachers and children need to use full sentences to explain or respond. When children use complete sentences, it both reveals their understanding and embeds their knowledge.
- **Stem sentences:** These help children express mathematical concepts accurately and scaffolds their responses.

  Eg:'*4 is a part, 5 is a part, 9 is the whole.*'
- **Consistency:** all use same mathematical terms in full, i.e ones instead of units

Ways to encourage maths talk at home

- Why is that a good mistake?
- If we know this, what else do we know?
- Give me . . .tell me . . .show me . . .
- Why is this the odd one out?
- The answer is . . .what is the question?
- Give me a silly answer for . . .?
- Always, sometimes, never true?



Any questions?