HeadStart International School, Phuket

Primary Maths Workshop

27/02/25

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Today's session

- What is teaching for mastery?
- Overview of our provision.
- Tips for how you can help at home.

What is teaching for mastery?

How it started

- Came about in response to the Programme for International Student Assessment (PISA) results in 2012
- Growing concern over the UK's performance as it continued a trend from PISA results in 2006 and 2009

Snapshot of performance in mathematics, reading and science

Countries/economies with a mean performance/share of top performers above the OECD average
Countries/economies with a share of low achievers below the OECD average

Countries/economies with a mean performance/share of low achievers/share of top performers not statistically significantly different from the OECD average

Countries/economies with a mean performance/share of top performers below the OECD average
Countries/economies with a share of low achievers above the OECD average

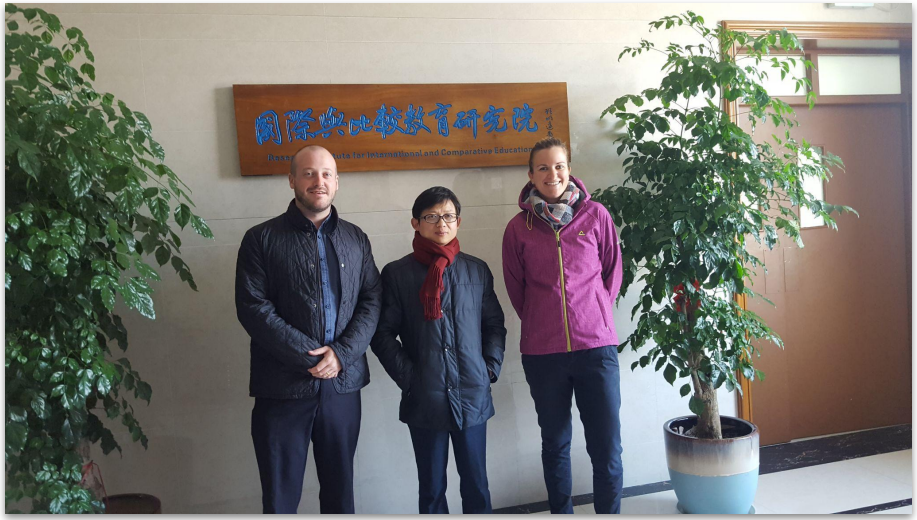
	Mathematics				Reading		Science	
	Mean score in PISA 2012	Share of low achievers in mathematics (Below Level 2)	Share of top performers in mathematics (Level 5 or 6)	Annualised change in score points	Mean score in PISA 2012	Annualised change in score points	Mean score in PISA 2012	Annualised change in score points
OECD average	494	23.0	12.6	**-0.3**	496	**0.3**	501	**0.5**
Shanghai-China	613	3.8	55.4	**4.2**	570	**4.6**	580	1.8
Singapore	573	8.3	40.0	**3.8**	542	**5.4**	551	**3.3**
Hong Kong-China	561	8.5	33.7	**1.3**	545	**2.3**	555	**2.1**
Chinese Taipei	560	12.8	37.2	1.7	523	**4.5**	523	-1.5
Korea	554	9.1	30.9	1.1	536	**0.9**	538	**2.6**
Macao-China	538	10.8	24.3	**1.0**	509	**0.8**	521	**1.6**
Japan	536	11.1	23.7	0.4	538	**1.5**	547	**2.6**
Liechtenstein	535	14.1	24.8	0.3	516	**1.3**	525	0.4
Switzerland	531	12.4	21.4	0.6	509	**1.0**	515	0.6
Netherlands	523	14.8	19.3	**-1.6**	511	-0.1	522	-0.5
Estonia	521	10.5	14.6	0.9	516	**2.4**	541	1.5
Finland	519	12.3	15.3	**-2.8**	524	**-1.7**	545	**-3.0**
Canada	518	13.8	16.4	**-1.4**	523	**-0.9**	525	**-1.5**
Poland	518	14.4	16.7	**2.6**	518	**2.8**	526	**4.6**
Belgium	515	19.0	19.5	**-1.6**	509	0.1	505	-0.9
Germany	514	17.7	17.5	**1.4**	508	**1.8**	524	1.4
Viet Nam	511	14.2	13.3	m	508	m	528	m
Austria	506	18.7	14.3	0.0	490	-0.2	506	-0.8
Australia	504	19.7	14.8	**-2.2**	512	**-1.4**	521	-0.9
Ireland	501	16.9	10.7	-0.6	523	**-0.9**	522	**2.3**
Slovenia	501	20.1	13.7	-0.6	481	**-2.2**	514	-0.8
Denmark	500	16.8	10.0	**-1.8**	496	0.1	498	0.4
New Zealand	500	22.6	15.0	**-2.5**	512	**-1.1**	516	**-2.5**
Czech Republic	499	21.0	12.9	**-2.5**	493	-0.5	508	-1.0
France	495	22.4	12.9	**-1.5**	505	0.0	499	0.6
United Kingdom	494	21.8	11.8	-0.3	499	0.7	514	-0.1
Iceland	493	21.5	11.2	**-2.2**	483	**-1.3**	478	**-2.0**

How it started

- Came about in response to the Programme for International Student Assessment (PISA) results in 2012.
- Growing concern over the UK's performance as it continued a trend from PISA results in 2006 and 2009.
- Began to investigate strongly performing countries (China and Singapore), leading to **England-Shanghai Teacher Exchange Programme** and development of **Maths Hubs**.

Shanghai-England Maths Teacher Exchange

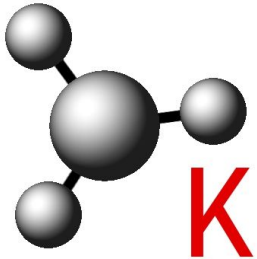
- Over 700 teachers from England and Shanghai participated in the exchange.



Teaching for Mastery

- A deep and thorough re-evaluation of **how** to teach maths.
- Focused on **deep** and **secure understanding** for **all** children.
- Linked to '**growth mindset**' (Carol Dweck).
- Underlying principle is that **everybody can do maths**.

A principled rethink of curriculum structure and classroom delivery.



Key Elements

Learning as a series of small, incremental and connected steps

‘Wisely and slow, they stumble that run fast.’
Friar Laurence, *Romeo and Juliet*

Small steps

- Pace of coverage is slower and concepts covered in more depth
- Curriculum designed for logical progression

  E.g. converting units of measurement before area and perimeter, properties of shapes (circles + angles) before statistics (pie charts), etc.
- Small steps connect together to provide deeper understanding
- Each ‘small step’ builds on previous success
- Approach is designed to increase retention and to avoid **cognitive overload**

Cognitive Overload

Try and remember these letters - I'll give you ten seconds.

PFBIJFKCIADNA


for what
to be best in any rela
point of view.
Volunteer
any service of on
without constraint
do something volu

Cognitive Overload

Is this any easier?

P FBI JFK CIA DNA

Rethinking differentiation

“I think it may well be the case that one of the most common ways we use differentiation in primary school… has had, and continues to have, a very negative effect on the mathematical attainment of our children… and that this is one of the root causes of our low position in international comparisons of achievement in mathematics education.”

Charlie Stripp, Director of the NCETM

Traditional setting of learning objectives by ability

Possible problems for ‘less able’:

- They are aware of being the lower group and this helps to fix a negative ‘I’m no good at maths’ mindset that will blight their mathematical futures.
- With easier work, the progress they make is restricted meaning that they fall further and further behind.
- Being challenged is a vital part of learning and with low challenge they can get used to not thinking hard about ideas and persevering to achieve success.

Traditional setting of learning objectives by ability

Possible problems for ‘more able’:

- Extension work can encourage the idea that success in maths is like a race, with a constant need to rush ahead.
- Can often involve unfocused work that contributes little to pupils’ understanding.
- Being identified as ‘able’ can limit future progress as they can be unwilling to tackle maths they find demanding if it challenges their perception of themselves.

Differentiation through ‘variation’ and ‘going deeper’

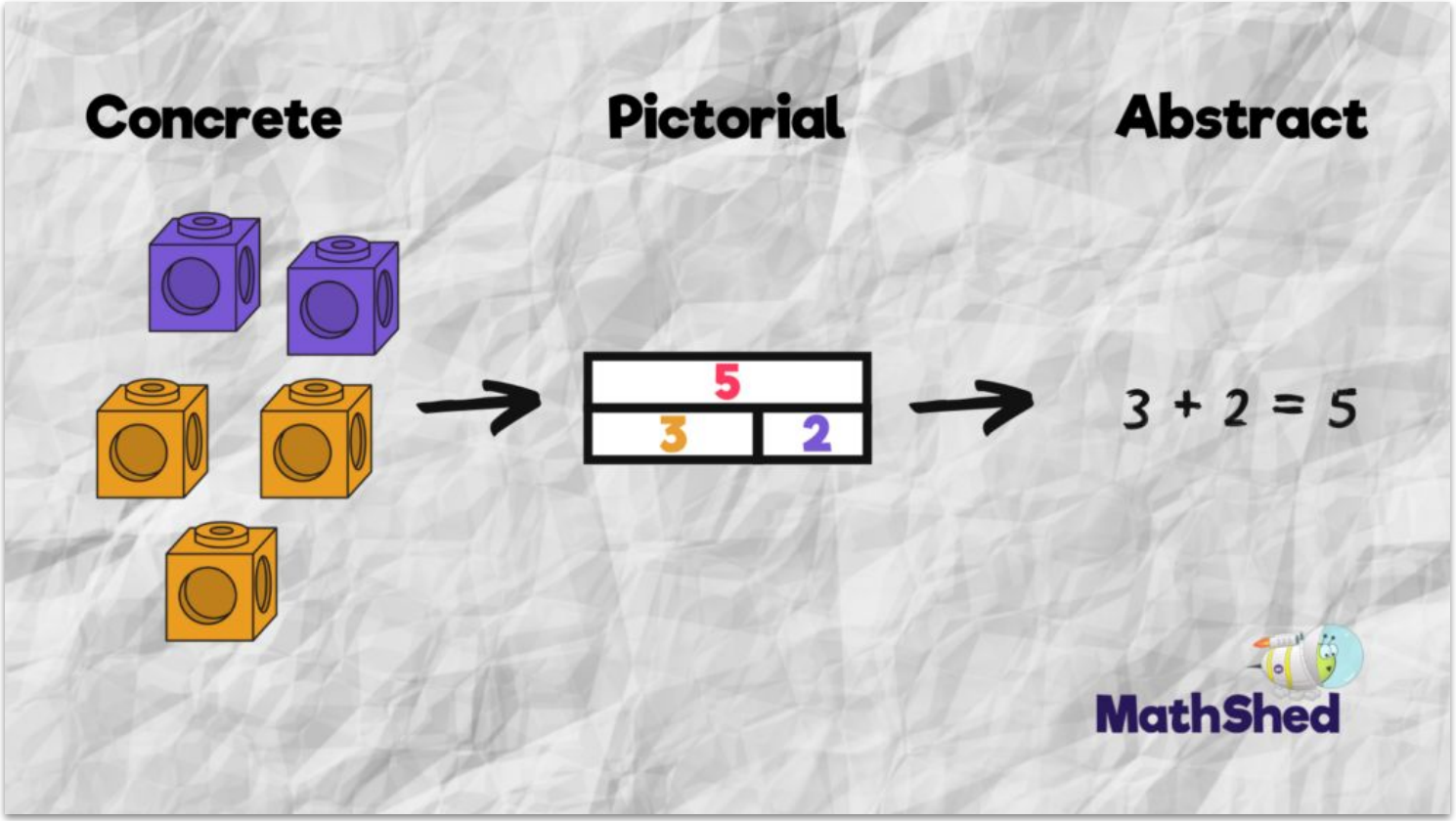
- Mastery classrooms still cater for children of all abilities.
- Children are exposed to concepts in multiple ways (**variation**), benefiting **all** children.
- Rather than racing ahead, children are extended with opportunities to apply their understanding to increasingly complex problems, learning to reason and explain their thinking using mathematical vocabulary.
- This fosters **deeper understanding**, better preparing them for future years.

The CPA Approach

CONCRETE -
using physical objects
to solve maths problems.

PICTORIAL -
using drawings
to solve maths problems.

ABSTRACT -
solving maths problems
using only numbers.


Concrete
Pictorial
Abstract
5
3
2
3 + 2 = 5
MathShed

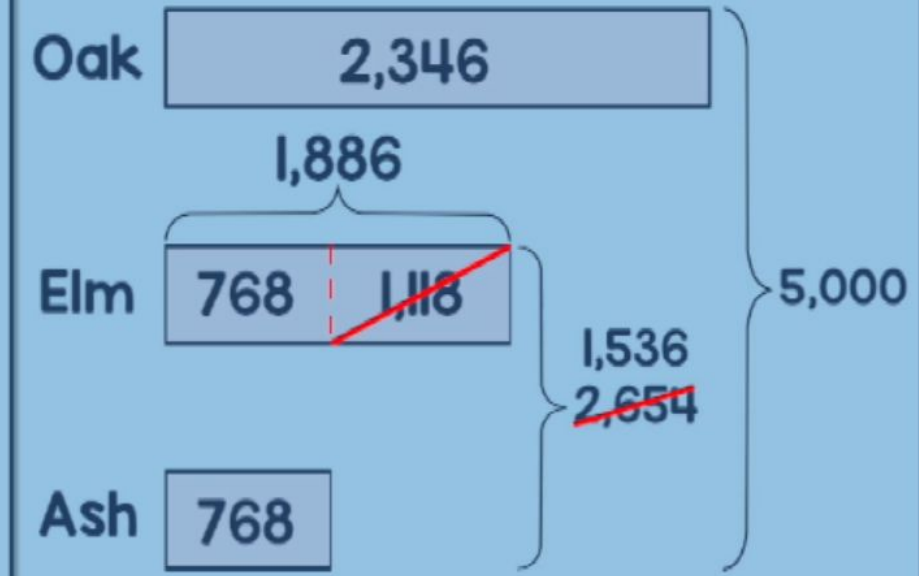
Should children move to abstract as quickly as possible?

There are 5,000 trees in a forest. The trees are either Oak, Elm or Ash.

There are 2,346 Oak trees. There are 1,118 more Elm than Ash trees.

How many Elm trees are there?

Model



Calculations

5,000 − 2,346 = 2,654

2,654 − 1,118 = 1,536

1,536 ÷ 2 = 768

768 + 1,118 = 1,886

There are 1,886 Elm trees.


VARIATION

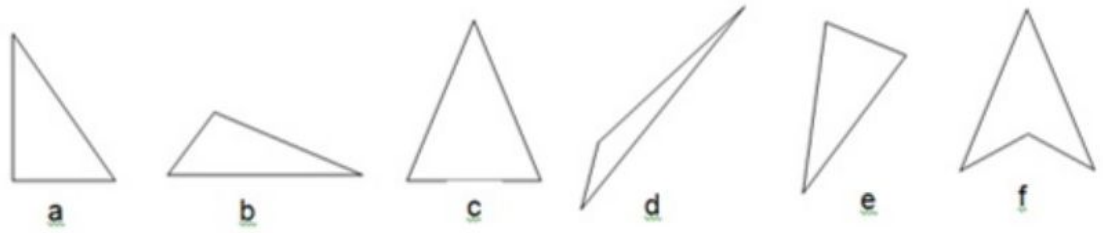
Conceptual variation

“Conceptual variation aims at providing students with multiple perspectives and experiences of mathematical concepts.”

Lai and Murray, Charles Sturt University

Conceptual variation

- Central idea is to highlight features of a concept or idea through showing it in different forms.
- Emphasises both **what it is** and **what it isn't**.
- Enables children to distinguish the essential and non-essential features.



Conceptual variation

- It is also about providing different representations so that all have a ‘way in’.
- Moving through ‘concrete’, ‘pictorial’ and ‘abstract’.
- Some children may need more exposure to different representations.
- Seeing things in different ways provides deeper understanding for **everyone**.
- Everyone is stretched and develops.

“If anything, in a mastery model, the very brightest kids have the most stretching experience. Every single concept in mathematics is infinitely extensible.”

Mark McCourt, CEO of La Salle Education

Procedural variation

- Carefully planned variation between one calculation and the next.
- Typically, it introduces increasingly difficult calculations that are the next step of the previous one.
- Questions are not mechanical practice in a large quantity - they are designed to make the pupil **think about what they are doing**.
- Can also be use of different calculations that prompt the pupil to compare and think.

A

8 x 5 =	8 x 3 =	9 x 4 =	9 x 4 =	7 x 9 =	1 x 4 =
2 x 8 =	5 x 2 =	3 x 9 =	6 x 3 =	6 x 8 =	8 x 5 =
1 x 1 =	3 x 8 =	2 x 5 =	9 x 2 =	7 x 7 =	4 x 6 =

B

2 × 3 =	6 × 7 =	9 × 8 =
2 × 30 =	6 × 70 =	9 × 80 =
2 × 300 =	6 × 700 =	9 × 800 =
20 × 3 =	60 × 7 =	90 × 8 =
200 × 3 =	600 × 7 =	900 × 8 =

Set A	Set B
120 – 90	120 – 90
235 – 180	122 – 92
502 – 367	119 – 89
122 – 92	235 – 180
119 – 89	237 – 182
237 – 182	502 – 367

Talking about maths

Talking about maths

- Explaining '**how**' and '**why**'.
- Careful use of questioning to draw attention to concept.
- Agreeing and disagreeing with 'reasoning'.
- Repeating other children's explanations.
- Learning and using **mathematical language**.
- Use of 'stem sentences'.

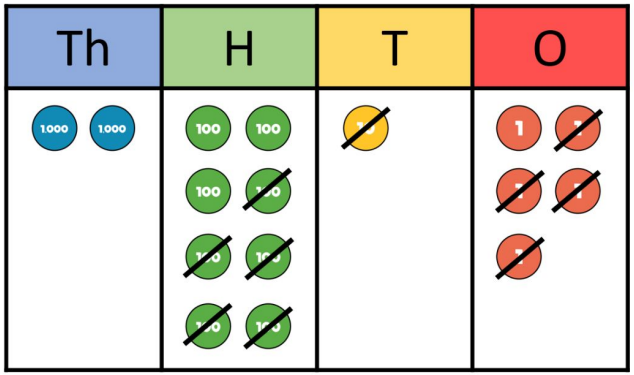

ow can we add one more here?
To find one more, add 1!
Phase 2 and 3


50

Talking about maths

$$2{,}815 - 514 = 2{,}301$$

minuend — subtrahend — difference



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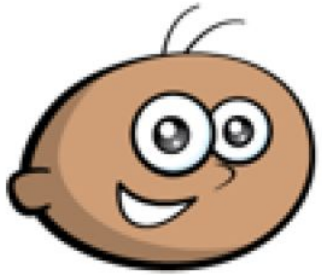
Th	H	T	O
2	8	1	5
	5	1	4
2	3	0	1

(Taken from White Rose Maths Premium Resources (Y4))

Tommy says,



The more decimal places a number has, the smaller the number is.

Do you agree?
Explain why.

(Taken from White Rose Maths SOL Y6 Spring Term)

Questioning

What is the same? What is different?

Can you draw...

What would happen if...

Prove that...

Can you show me another way?

Why is that correct?

Can you explain your reasoning?

Overview of our provision

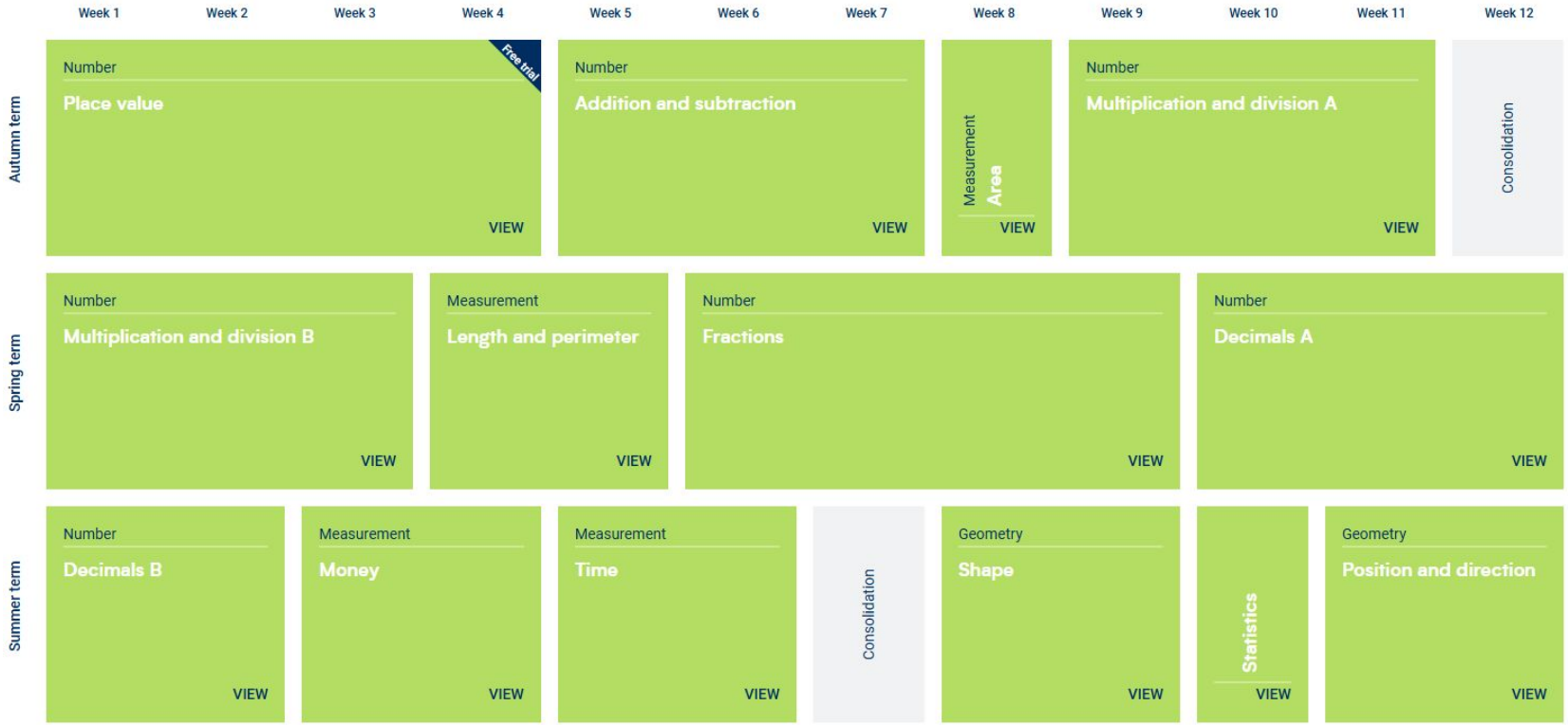
Overview of our provision

- Maths journey begins in Foundation.
- Throughout PreSchool, Early Years and Reception, children explore numbers, shapes, space and measurement through their play.
- Learning progresses to understanding the function of numbers, writing and expressing them, subitising and cardinality.
- Emphasis on deep understanding of number to build solid foundations for the future.

Overview of our provision

- Embedded mastery principles into our teaching practice.
- We use the highly-regarded White Rose Maths Schemes of Learning.
- Although not all lessons are the same, independent practice often follows a ‘Try it! Twist it! Deepen it!’ structure.

Example Scheme of Learning

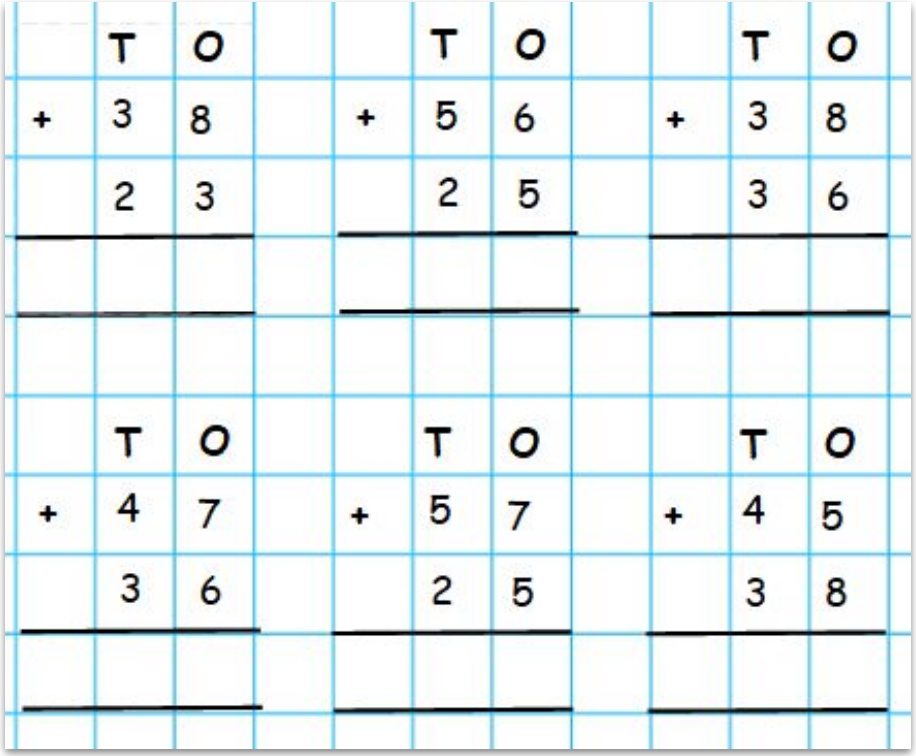


(White Rose Maths Scheme of Learning Y4 2024/25)

Try it! Twist it! Deepen it!

Try it!

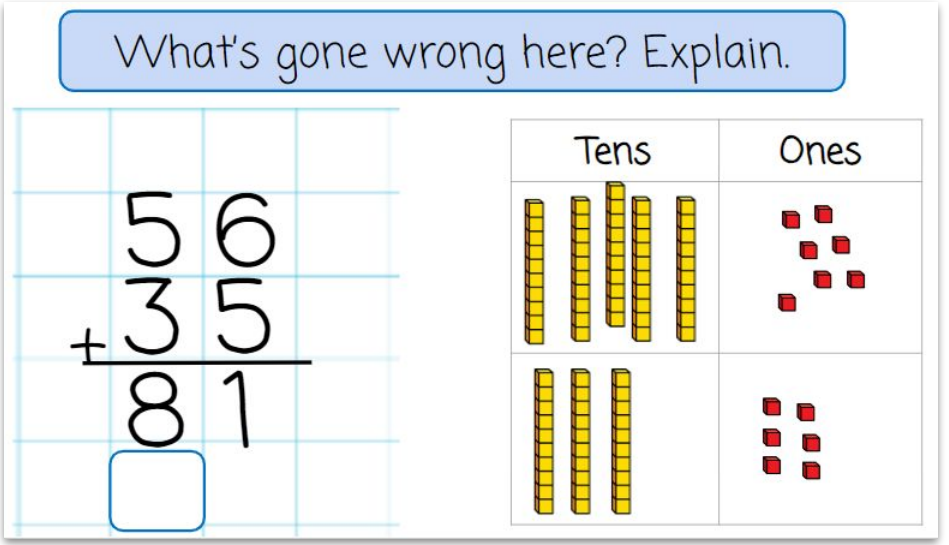
- Focus on securing the main concept and practising procedural fluency.
- There should only be around 4-6 questions for students to showcase they understand the concept.



Try it! Twist it! Deepen it!

Twist it!

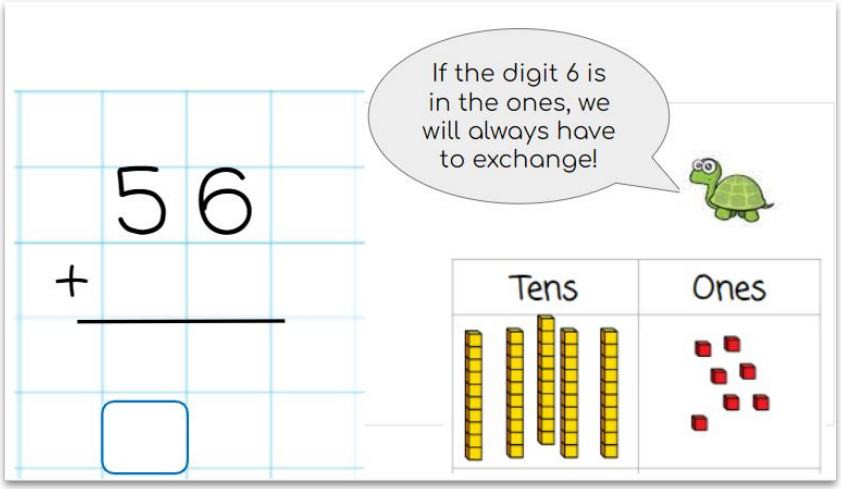
- Focus on misconceptions and opportunities to reason.
- Examples may include ‘True or False’ or ‘Do you agree’ questions.



Try it! Twist it! Deepen it!

Deepen it!

- A problem solving opportunity to apply learning and challenge mathematical thinking.
- Examples include ‘here’s the answer, what’s the question?’; making a rule, finding all possibilities or always/sometimes/never.



Overview of our provision

Extension Challenge

Some children may require further ‘Deepen it’ style questions as an extension.

End of lesson reflection

End of lesson reflection/key question

- May be verbal or summarised in a sentence.
- May include key vocab / sentence stem / rule for the lesson.
- May be a form of self-assessment.

Assessments

We assess in many ways:

- Teachers assess formatively in lessons.
- Teachers track children's learning for each objective on Learning Ladders.
- Children complete End of Block assessments at the end of each unit.
- Children sit three Termly Assessments - Arithmetic and Reasoning and Problem Solving.
- At the end of the school year, children sit a GL Progress Test.

Something to think about…

‘Before children start school they often talk about maths with curiosity and wonder, but soon after they start school many children decide that maths is confusing and scary and they are not a “maths person”.

This is because maths in many schools is all about procedures, memorization and deciding which children can and which cannot. Maths has become a performance subject and students of all ages are more likely to tell you that maths is all about answering questions correctly than tell you about the beauty of the subject or the way it piques their interest.’

Dr. Jo Boaler, Professor of Mathematics Education at Stanford University


11
2
3
5
1
4
14
8
7
13
10
6
12
9
15

How you can help at home

- Avoid sharing the idea of being ‘bad at maths’ or that you ‘don’t like maths.’
- Always be encouraging - treat mistakes as opportunities to discuss the approach to the question.
- Focus on the **how** and the **why**, not the answer.
- Check that your child has covered a concept in school before practising fluency.
- Look for maths in the ‘real world’.

Useful links

- Concrete resources explained: https://thirdspacelearning.com/blog/concrete-resources-cpa-explained/ (also other great articles on the website)

- White Rose Maths Parent Workbooks: https://whiteroseeducation.com/parent-pupil-resources/maths/free-downloads

- Nrich (problem solving Maths games): https://nrich.maths.org/

Useful apps

- 1-minute Maths app (tablet or phone)

- Numbots (website, tablet or phone)

- Times Table Rock Stars (website, tablet or phone)

Questions