Welcome to teaching the new Maths Framework

Year one and two.

The National Curriculum for mathematics aims to ensure that all pupils:

Become fluent – varied and frequent practice – increasingly complex problems – conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

Reason mathematically – follow a line of enquiry, inferring relationships and generalisations, developing an argument/justification or proof using mathematical language.

Can solve problems – can apply their mathematics to problems, can break down problems, persevere in seeking solutions.

…research has identified the **ability to reason mathematically** as the most important factor in a pupil's success in mathematics…

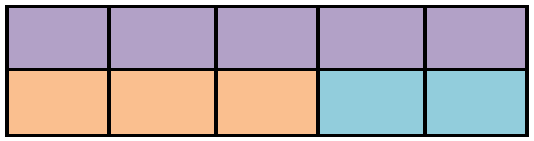
Reasoning is integral to the development of conceptual understanding and problem-solving skills.

Talk for Maths must focus to some extent on the 'how' and increasingly more on the '**why**', '**why not**', and '**what if**?' in teachers' explanations and questions as well as pupils' responses…

Planning three parts to each maths lesson.

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
Count in multiples of twos.	• Continue the pattern: 2, 4, 6, 8, __, __, __, __ • Fill in the missing numbers. 6 | | 10 | | | 16 • How many socks are there altogether? 	• **True or False?** I start at 2 and count in twos. I will say the number 9. • I am going to count on in twos from 3. Will I say an even number? Prove it. • I am going to count back in twos from 20. How many steps will it take me to reach 0? Convince me.	• There are 2 flowers in each pot. How many flowers in 10 pots?  • In the story Noah's Ark, the animals went in 2 by 2. If there were 2 of every animal below, how many animals were there altogether?  • If there were 30 animals on the ark, how many pairs of animals were there?

Singapore methods – year one

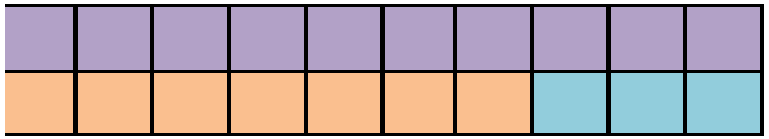
- 

Using the picture we can make 4 number sentences.

3 + 2 = 5 5 – 2 = 3

2 + 3 = 5 5 – 3 = 2

Can you write four number sentences using this picture?



Year one mastery with greater depth

Which number could be the odd one out? Why?

40	71	65

Pupils suggest their own reasoned ideas, for example 71 might be the odd one out because it's not a multiple of 5.

Sam says 40 is the odd one out. What reasons did she give?

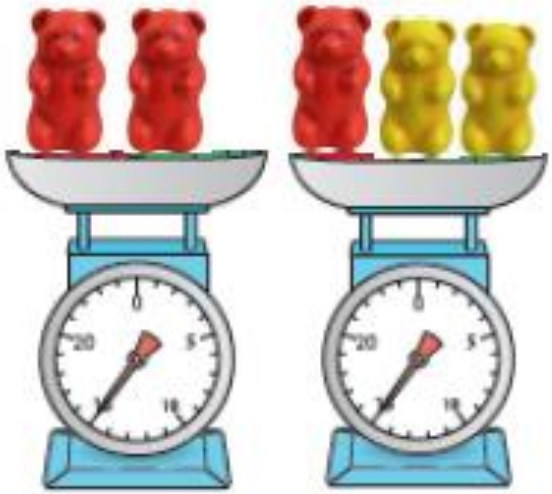
Pupils suggest their own reasoned ideas, for example 40 might be the odd one out because it's not an odd number.

What's the same? What's different?

45	54

Year two

- How much do the 2 red bears weigh?



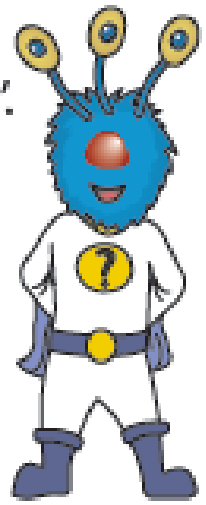
Which is heavier the red or the yellow bear? Explain your reasoning.

Mastery with greater depth – year two examples

Captain Conjecture says,
'An odd number + an odd number + an odd number = an even number'.
Is this sometimes, always or never true?

Explain your reasoning.

Concrete resources might help pupils to explain their reasoning.



Encourage discussion and reasoning:

- ❑ What do you notice?
- ❑ True or false?
- ❑ Odd one out?
- ❑ Do, then explain
- ❑ Spot the mistake
- ❑ Give an example of
- ❑ Continue the pattern
- ❑ Convince me…prove it!

Enables children to develop insight

A **conceptually** orientated classroom…how would you typify this learning?

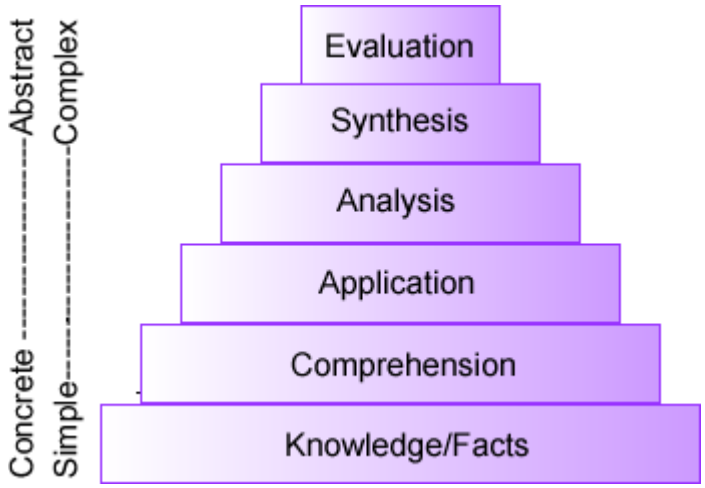
based on ideas or principles

Less ‘how?’ and more ‘why?’

Bloom's Taxonomy is a hierarchy of skills that reflects growing complexity and ability to use higher-order thinking skills (HOTS).

More than just facts

Children make connections – concepts are explored together to make mathematical relationships explicit



Conceptual understanding allows a student to apply and possibly adapt some acquired mathematical ideas to new situations.

A math concept is the 'why' or 'big idea' of math. It is why addition works the way it does and why multiplication does what it does. Knowing a math concept means you know the workings behind the answer. You know why you got the answer you got and you don't have to memorize answers or formulas to figure them out.

Examples of conceptual mathematics teaching:

Year 2 onwards: the use of zeros with place value problems is simple, but critical for understanding. "What is 20 + 70?" A child who can effectively explain the mathematics might say, "20 is 2 tens and 70 is 7 tens. So, 2 tens and 7 tens is 9 tens. 9 tens is the same as 90.“

For years 1 through 4, basic facts for all four operations are major parts of the mathematics curriculum. "What is 6 + 7?" Although we eventually want computational fluency by our children, an initial explanation might be "I know that 6 + 6 = 12; since 7 is 1 more than 6, then 6 + 7 must be 1 more than 12, or 13." Similarly, for multiplication, "What is 6 x 9?" "I know that 6 x 8 = 48. Therefore, the product 6 x 9 must be 6 more than 48.”

What we are aiming towards.....

In Year 6, fractions, decimals, and percents are integrated in problem situations. "What is 25% of 88?" Rather than multiplying .25 x 88, conceptual understanding of this problem might include "25% is the same as 1/4, and 1/4 of 88 is 22 as I can half and half again." Concepts are integrated to find the answer.

Ideas about even and odd numbers are included in KS1. Using manipulatives or making drawings to show and explain why 5 is an odd number and 8 is an even number provides evidence that a student has conceptual understanding of the terms. "5 is an odd number because I can't make pairs with all of the cubes (squares). 8 is an even number because I can make pairs with all of the cubes.

Learning with understanding is essential to enable students to solve the new kinds of problems they will inevitably face in the future.

LEVELS OF THINKING	GUIDE QUESTIONS
Memory: recalls or memorises information	What have we been working on that might help with this problem?
Translation: changes information into another form	How could you write/draw what you are doing? Is there a way to record what you've found that might help us see more patterns?
Interpretation: discovers relationships	What's the same? What's different? Can you group these in some way? Can you see a pattern?
Application: solves a problem - use of appropriate generalisations and skills	How can this pattern help you find an answer? What do think comes next? Why?
Analysis: solves a problem - conscious knowledge of the thinking	What have you discovered? How did you find that out? Why do you think that? What made you decide to do it that way?
Synthesis: solves a problem that requires original, creative thinking	Who has a different solution? Are everybody's results the same? Why/why not? What would happen if....?
Evaluation: makes a value judgement	Have we found all the possibilities? How do we know? Have you thought of another way this could be done? Do you think we have found the best solution?

Key Stage one SATs

Two papers which all children must sit.

No manipulative – only a ruler.

Children can have a reader under specific guidance – monotone voice.

Test mark is only for guidance as some elements are not possible to assess using the current form of testing; they will need to be assessed by teachers as part of their statutory assessment of the complete national curriculum.

- The first paper is an arithmetic paper. The second paper presents a range of mathematical reasoning and problem solving questions. The test is administered on paper.
- The tests are designed to enable pupils to demonstrate their attainment and as a result are not strictly timed since the ability to work at pace is not part of the assessment. However, elements within the curriculum state that pupils should be able to use quick recall of mathematical facts and the arithmetic paper is designed to assess some of these elements.

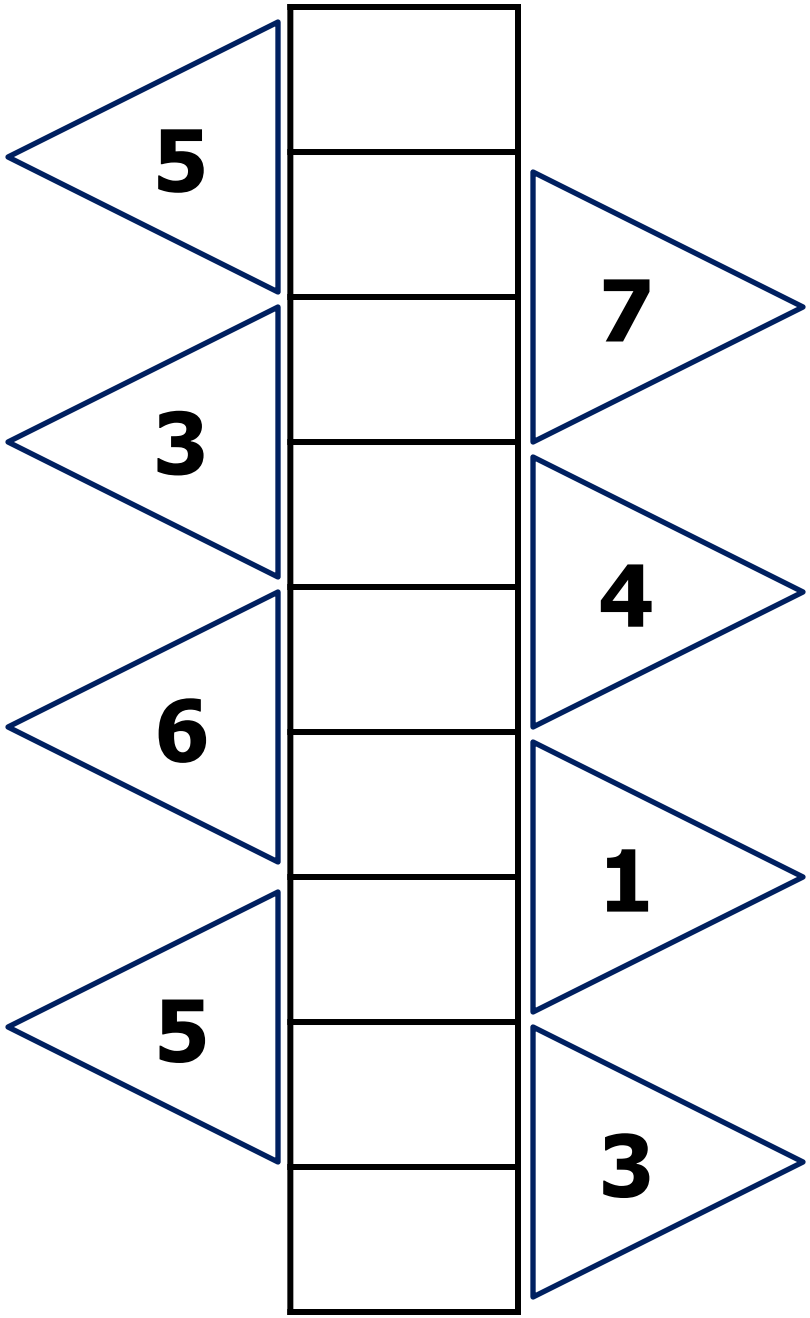
Example questions from paper one – arithmetic

- 5 + 7 =
- 39 – 8 =
- 50 – ☐ = 20
- 2 x 0 = 3 x 3 = 8 x 10 =
- 35 divided by 5 =
- 1/4 of 20 =
- 65 + ☐ = 93
- 3/4 of 40 =

Example questions from paper two - reasoning

- https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/439522/Sample_ks1_mathematics_paper2_reasoning.pdf

Difference Ladder



Place the numbers 1 to 9 in the rectangles so that the difference between each pair is the same as the number in the triangle.

1 7
4
2 8
5
3 9
6

Thank you for listening.