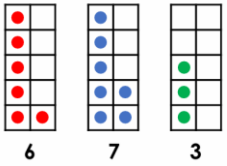
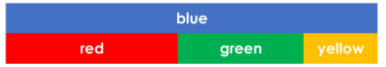
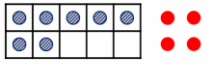
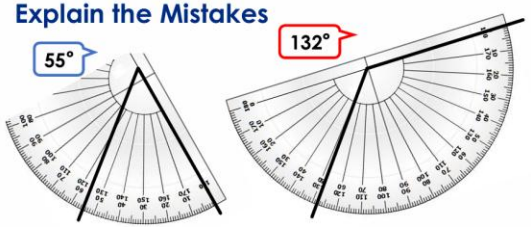
Reasoning Routines Toolkit

	KS1 Examples	LKS2 Examples	UKS2 Examples
Visual Representations Children interpret an image that highlights a mathematical idea. This could be a real-world image or an image that highlights a specific concept.	**Read the Picture**  6 7 3 Add ☐ + ☐ first 6 + 7 + 3 = ☐	**Correct or Incorrect?**  blue red green yellow ✓ or ✗ ☐ blue = green + red + yellow ☐ blue – red = green + yellow ☐ blue + yellow = red + green ☐ blue – green = red + yellow	**Explain**  **Complete the sentences:** purple + orange = black – blue = *Write your own.*
Misconceptions Children explain common errors by comparing correct responses to common errors. Children may select the correct answer and explain why another answer is false.	**Which Answer?** 7 + 4 = ☐  Partition 4 into 2 and 2 Partition 4 into 3 and 1	**Explain the Mistake**  This shows that 21 ÷ 4 = 4 remainder 5	**Explain the Mistakes**  55° 132°
Contexts Sometimes, children's real-world knowledge can help them to understand a concept and its purpose. These tasks can be used at the start of a unit.	**Explain the Mistake** ✘  The pizza has been cut in thirds	**Contexts** For each pair, **circle the larger fraction:** A foot as a fraction of the body **OR** A foot as a fraction of the leg The hall as a fraction of the school **OR** The classroom as a fraction of the school	**Explain** **Here are two examples where we use rounding:** To say how many people live in Scotland. To give the time of the day. ***Why do we use rounding in these situations?*** ***Think of other examples where we use rounding.***
Slow Reveal Parts of a question can be hidden, and children apply their understanding to predict what the missing information will be. This applies to word questions and other contexts.	There are 3 nests. *What information could be here?* There are ☐ **How many eggs are there altogether?**	There are 29 children in Oak Class. There are ☐ **How many children in Oak Class and Beech Class altogether?** *What information could be here?*	**Order the fractions from smallest to largest:** $\frac{3}{5}$ $\frac{1}{\square}$ $\frac{7}{\square}$ $\frac{9}{\square}$ ***What could the denominators be?***

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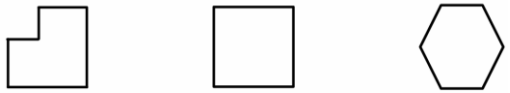
Estimation In KS1, number sense is built by children reasoning about quantities without counting. In KS2, reasoning tasks help children with the skill of being able to give an estimate to a calculation.	**Estimate** **Estimate how many squares ▢ fit in each bar.** 2 8	**Estimation** **27 × 7** The answer is **odd/even.** **20 × 7 = 140** **30 × 7 = 210** Estimate for **27 × 7** ▢	**Estimation** **584 × 9** The answer will be **odd/even.** **500 × 9 = 4500** **600 × 9 = 5400** Estimate for **584 × 9 is** ▢
Related Facts Children make connections between questions and spot patterns. Given one fact, they derive the next fact. 'I know… so…' and 'Small Difference Questions' are the common reasoning titles for this technique.	**Small Difference Questions** 6 + 4 = 10 4 + 4 = 8 6 + 6 = 12 8 + 8 = 16 7 + 5 = 12 8 + 7 = 15 17 + 5 = 22 9 + 6 = 15 5 + 17 = 22 9 + 16 = 25	**I know… so…** **8 × 4 = 32** **20 ÷ 2 = 10** **16 ÷ 2 = 8** 32 ÷ 8 = ▢ 20 ÷ 4 = ▢ 18 ÷ 2 = ▢ **5 × 7 = 35** **24 ÷ 8 = 3** **12 ÷ 3 = 4** 35 ÷ 7 = ▢ 24 ÷ 4 = ▢ 15 ÷ 3 = ▢	**Small Difference Questions** 45 ÷ ▢ = 0.45 24 ÷ ▢ = 1 45 ÷ ▢ = 1 24 ÷ ▢ = 0.5 45 ÷ ▢ = 0.1 24 ÷ ▢ = 0.05
Odd One Out Given 3 or more examples, children apply their understanding to say which example is the odd one out. They might be able to find reasons why each example could be considered the odd one out.	Which shape is the **odd one out?**  ***Extend:*** *give a reason for each shape.*	**Odd One Out** 	**Odd one out** 3, 6, 9, 12 4, 7, 10, 13 4, 8, 12, 16

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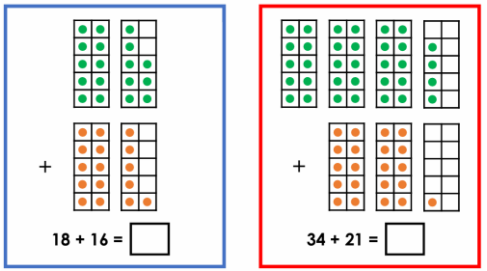
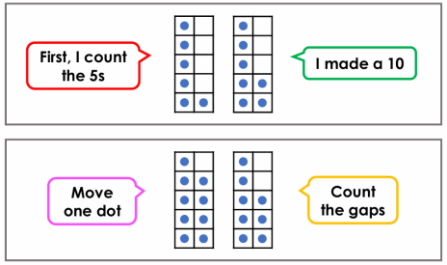
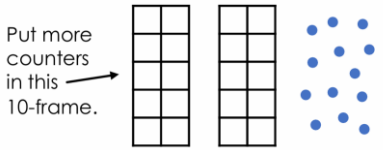
Rank by Difficulty Children compare 2 or more questions, considering which question is harder. The differences between the questions highlight a specific aspect of a mathematical structure.	**Rank by Difficulty**  *Which question was harder? Why?*	**Rank by Difficulty** **Answer the questions. Then, order them by difficulty:** (a) What is the time 35 minutes before 9:40am? (b) What is the time 35 minutes after 9:40am? (c) It is 40 minutes after 11:30am What is the time? (d) It is 45 minutes before 11:50am. What is the time? *Question… was hardest because…* *There were fewer steps to calculate… as…*	**Rank by Difficulty** **Write each number in Roman Numerals.** **33 =** **49 =** **65 =** *Which numbers were easiest/hardest to write in Roman Numerals?*
Different Ways These tasks allow children to explore different possible strategies for finding the answer. Different approaches can be compared.	**Different Ways** How many dots? *No counting!*  	**Which Method?** **563 – 349 =** **348 – 176 =** **384 – 172 =** **405 – 190 =** **308 – 295 =** *I calculated the difference for…* *I used a column method for… because…* *You can also…*	**Broken Calculator** *'The 8 key on my calculator is broken!'* ***How can I use my calculator to work out:*** **26 × 8** **80 × 15**
Different Answers Explanation find different answers to a question. For 'How Many Ways?' questions, children are challenged to find all possible answers to a question, which requires systematic working.	**How Many Ways?** Put **13 counters** on two 10-frames.  	**How Many Ways?** Fill each gap with a **single-digit number:** $\frac{\square}{\square}$ of 24 = $\square$ ***Level 1:*** *I can find an answer* ***Level 2:*** *I can find different answers* ***Level 3:*** *I know how many answers there are*	**How Many Ways?** $\frac{\square}{8} + \frac{1}{\square} = \frac{\square}{4}$ ***The answer must be a proper fraction.*** ***Level 1:*** *I can find a way* ***Level 2:*** *I can find different ways* ***Level 3:*** *I know how many ways there are*