MATH ROCKS

Purpose of today's meeting:

- Share Crossdale's calculation policy – how we teach +, X, - and ÷
- Discuss how children use calculations for problem solving and reasoning.
- Allow parents to see what happens in classrooms

The examples on the next for slides are taken from the Year 6 ‘expected’ standard and show how children are asked to use reasoning and problem solving skills to answer questions involving +, X, - or ÷

More, similar problems can be found here.

1 Seb saved up for a new skateboard that cost £40

The table shows how much money he saved each week.

Week number	1	2	3	4	5	6	7	8	9	10
Amount saved	£5	£4	£2	£4	£3	£4	£6	£4	£3	£5

In which week did Seb reach **half** the amount he needed for the skateboard?

Week _____

1 mark

If Seb had saved an extra £1 each week, in which week would he have reached his target of £40?

Week _____

1 mark

2 Four children are in a race.

Chen is 2 metres ahead of Alfie.

Nina is 5 metres behind Megan.

Alfie is 3 metres behind Megan.

Write the names of the runners in order, starting with the child who is furthest ahead.

_____ _____ _____ _____

furthest ahead

1 mark

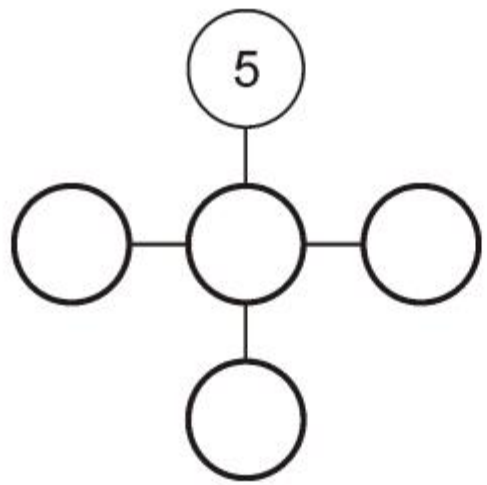
1 mark

3 Here are five number discs.

Look at the cross pattern below.

Use each disc **once** so that the total across is the same as the total down.

One has been done for you.



1 mark

4 Liam has two different sizes of rectangle.

He makes this pattern with them.

Not actual size

Calculate the lengths of **A** and **B**.

A = **cm**

1 mark

B = **cm**

1 mark

All of the questions you have had a go at were taken from the 2016 Y6 SATs papers. The 'Expected Standard' for Y6 now means that most children should be able to answer questions such as these. Y6 children now have to take 3 tests:

- Paper 1 - 38 questions on calculation to be answered in 30 minutes
- Paper 2 - 20 questions to be answered in 40 minutes
- Paper 3 - 21 questions to be answered in 40 minutes

As an adult, how do you find the questions? How confident would you be in completing papers 2 and 3 in 40 minutes? Are the questions tricky, easy – how did you approach them?

We have included the questions here so you clearly understand the pitch and challenge of the maths curriculum by end of Y6.

A few objectives by end of Reception:

- *Count with numbers 1-20 and place them in order*
- *add and subtract two single digit numbers*
- *count on or back on a number line*

Looking at the examples from Y6, what's the journey for your child?

To get your children from the Reception expectation to the Y6 expectation we teach the National Curriculum and approach maths teaching by splitting it into 3 areas:

- Fluency
- Reasoning
- Problem Solving

Fluency

What is fluency?

The first thing to say is that fluency is not only about number – there are other areas of the curriculum where fluency is important. However it's probably sensible to acknowledge that number is by far the largest part of the maths curriculum. We're not the only nation to take a recent interest in this – in the US the new standards have quite a lot to say about being fluent:

Students exhibit computational fluency when they demonstrate flexibility in the computational methods they choose, understand and can explain these methods, and produce accurate answers efficiently.

Reasoning

What is Reasoning?
Reasoning is fundamental to knowing and doing mathematics. Some would call it systematic thinking, and the ability to talk about maths, spotting patterns and connections. Reasoning enables children to make use of all their other mathematical skills and so reasoning could be thought of as the 'glue' which helps mathematics makes sense.

The second aim of the new mathematics national curriculum in England (DfE, 2013) is that all pupils will:

> *reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language.*

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Problem Solving

What is Problem Solving?

The problem-solving process can be described as a journey from meeting a problem for the first time to finding a solution, communicating it and evaluating the route. There are many models of the problem-solving process but they all have a similar structure. This will involve:

-Comprehension
-Representation
-Planning, analysis and synthesis
-Execution and communication
-Evaluation

At Crossdale we use RUCSAC (Read, Underline, Choose, Solve, Answer, Check) and the Maths Toolkit to structure and support children's problem solving endeavours

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The 3 slides below show how Learning Objectives from different year groups might be split into Fluency, Reasoning and Problem Solving elements.

Parents can best support school by focussing on the fluency aspects of the curriculum

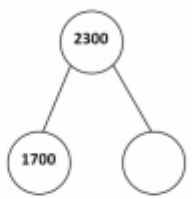
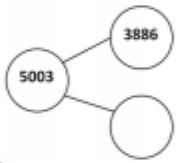
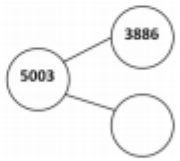
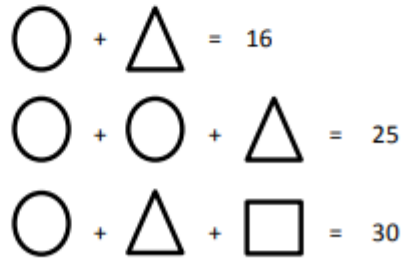
Term by Term Objectives

Year 2

	National Curriculum Statement	All Students		
		Fluency	**Reasoning**	**Problem Solving**
Addition and Subtraction	Show that the addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot.	• Complete the number sentences. 3 + 4 = ☐ 4 + 3 = ☐ 7 – 4 = ☐ 7 – 3 = ☐ 7 = 3 + ☐ 7 = ☐ + 3 7 – ☐ = 4 7 – ☐ = 3 ☐ + 3 = 7 ☐ + 4 = 7 ☐ – 3 = 4 ☐ – 4 = 3 • Use = < or > to complete the number sentences. 64 + 13 ☐ 13 + 64 23 – 12 ☐ 12 – 23 • Here is a fact family. 12 + 5 = 17 5 + 12 = 17 17 – 5 = 12 17 – 12 = 5 Use these numbers to create your own fact family. 11 27 16	• True or False? These four calculations have the same answer. 1 + 4 + 2 2 + 4 + 1 4 + 2 + 1 4 + 1 + 2 Explain your answer. • True or False? These four calculations have the same answer. 7 – 3 – 2 2- 3- 7 3 – 2 – 7 7 – 2 – 3 Use cubes to help to explain your answer. • Write the missing symbols + - and = in the number sentence. Can you complete it in two different ways? 40 ☐ 23 ☐ 17 40 ☐ 23 ☐ 17	• Use the number cards below to make as many addition and subtraction sentences as you can. How many can you make? 3 7 4 10 • What could the values of the circle and triangle be? ● + ▲ = 12 12 - ● = ▲ • How many number sentences can you write to describe the part whole model? 50 27 23

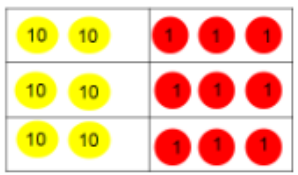
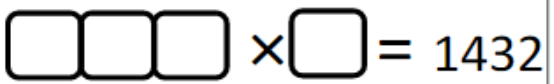
Term by Term Objectives

Year 4

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Addition and Subtraction	Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate.	• Complete the part-whole models    • Choose whether to solve these questions mentally or using written methods. 54 + 46 540 + 460 34 + 69 + 26 298 + 342 566 + 931 999 + 999 1,547 + 2742 1,999 + 364	• Complete the calculation □04 - 2□1 34□ • Desani adds three numbers together that total 7,170  They all have 4 digits. They are all multiples of 5 What could the numbers be? Prove it.	• A game to play for two people. The aim of the game is to get a number as close to 5,000 as possible. Each child rolls a 1-6 die and chooses where to put the number on their. Once they have each filled their grid, they add up their totals to see who is the closest. | | ? | ? | ? | ? | | + | ? | ? | ? | ? | • All of the digits below are either a 3 or a 9. Can you work out each digit? 7,338 = ???? + ???? • Work out the value of each shape 

Term by Term Objectives

Year 6

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Four Operations	Multiply multi-digit number up to 4 digits by a 2 digit number using the formal written method of long multiplication.	• Which calculation gives the smallest answer? 3,678 × 23 2,678 × 230 1,598 × 46 • Abby planted 573 bulbs. The packet showed each flower should have 13 petals. How many petals should there be altogether? • Work out the missing number. Explain how you know. 80 × ▭ = 560000 What other facts do you know from this?	• Miss Brown estimates the following 4,999 x 40 = 200,000 Do you think she was right to that? Explain your reasons. • Write true or false next to each statement. Explain your reasons for each answer. 572 × 6 gives the same answer as 6 × 572 3 × 172 = 172 + 172 + 172 10 × 10 × 4 = 20 × 4 • Work out the missing number. 26▭ × 8 = 2152 How did you find the answer?	• Craig says "250 ends in a zero therefore, when multiplying, I can only make 250 by multiplying by 5 or 10." Do you agree? How many ways can you find to disprove this? • A class are solving multiplication problems using counters. One child arranges their counters like the diagram below. The question is 23 x 3 =  Is this the only way to represent this calculation? How many ways can you find? • Can you complete the following calculation to create 1432?  What is the closest answer you can make? How do you know it is the closest?

Today

- NOT a typical day in school
  - Trying to show you a range of calculation strategies and approaches.
  - Differentiation – typically we see 3 or 4 levels of differentiation. Today may be different. Challenge can come on the form of language used; method used; variable numbers; adding more steps to a problem; focus on reasoning and problem solving (broader not deeper).
- Please stay in your child's class.

- How can you help
  - Look at the booklets the teachers have prepared
    - Do you understand the calculations strategies?
  - Support homework:
    - My Maths
    - Doodle Maths
    - Times table Rock Stars