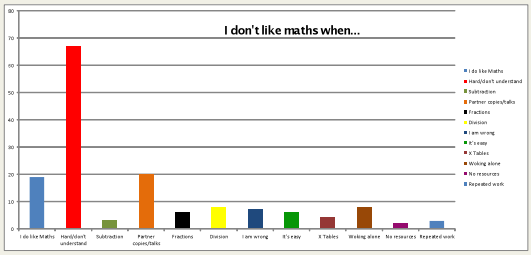
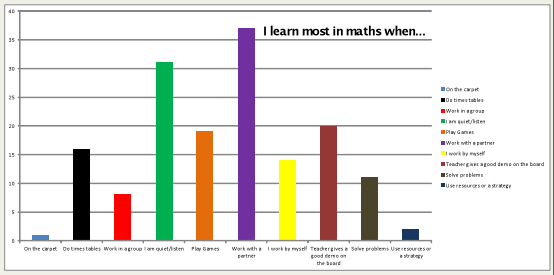
Mastery for LA Learners
NRICH/Parents/Reasoning

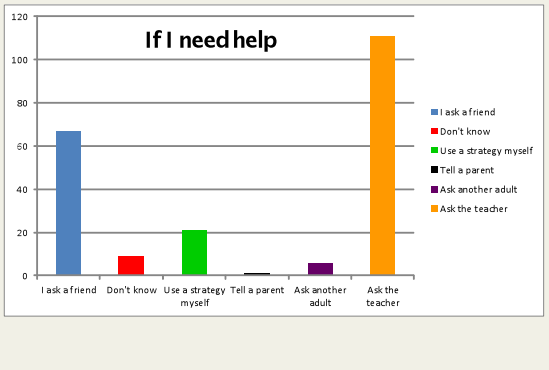
Tuesday 13th October 2015

David Joyce
North Harringay Primary School

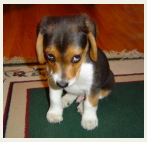
A worrying trend in school was a stubbornly large group of lower achievers.







Causes



Leading on from developing self-assessment to reasoning in Maths and explaining.

"Is like….when you….."

After many years watching and designing mathematics lessons, it has become clear to me that most of the attention is on 'answer-getting', not on improving the quality of the reasoning.

As soon as pupils get the answer, they are moved onto a fresh problem, they don't reflect much on the process they went through.

Reasoning is not improved because it does not become the object of attention.

Most reasoning remains invisible it stays inside people's heads.

In order for students to improve their reasoning, it needs to be made visible and audible through oral or written explanations.

Malcolm Swan, NRICH, Cambridge University.

What is _____?

Why is it _____?

Freak out!

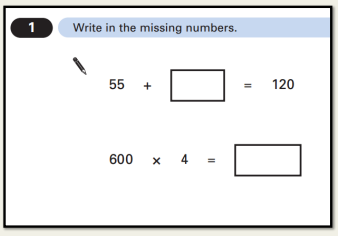
The great Reasoning movement began…

YOU ARE ABSOLUTELY CORRECT.
WELL DONE. NOW, WHY ARE YOU CORRECT?

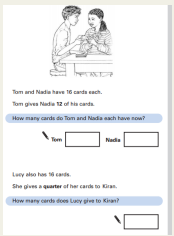
OR

WHY IS SHE CORRECT?

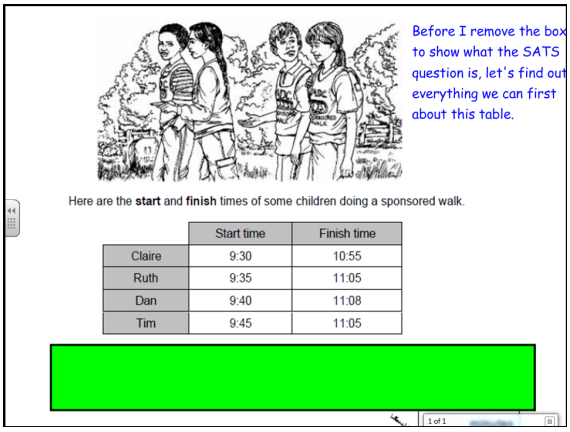
Okay, prove it!



I don't care what the answer is, just tell me how to go about getting it…

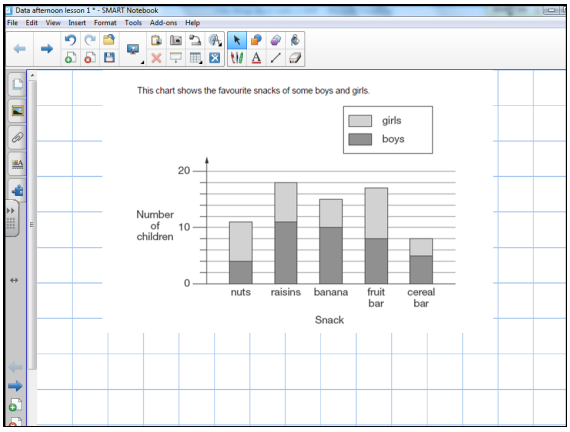


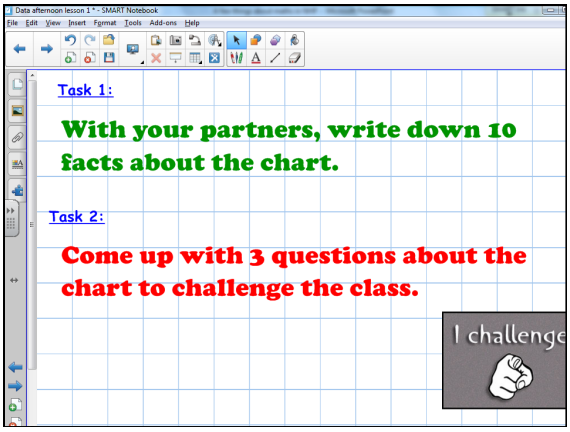
No, no. Tell me what to do!



Tip Time!

Write your tip on your whiteboard then give your whiteboard to another person to read out.





In a problem:

- Reasoning is necessary when:
  - The route through the problem is not clear
  - There are some conflicts in what you are given or know
  - There are some things you don't know
  - There is no structure to what you're given
  - There are different possible solutions
  - All of which require mental work….

Reasoning is…

- A critical skill to knowing and doing maths
- Enabling – it allows children to make use of all the other mathematical skills – it's the glue that helps maths to make sense.

Progression in reasoning

Step 1: **Describing**

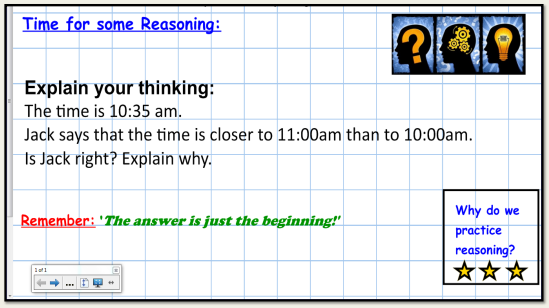
Step 2: **Explaining**

Step 3: **Convincing**

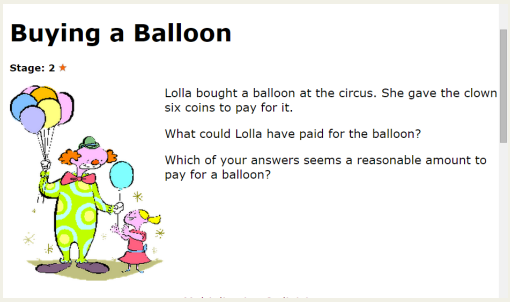
Step 4: **Justifying**

Step 5: **Proving**

Scaffold for staff

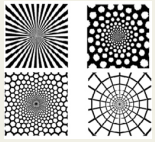


Let's look at some activities.



'The search for pattern'

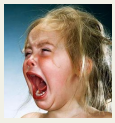
- Try using only 1p or 5p coins – what combinations do you come up with.
- Now try using only 1p and 10p coins – do you see a pattern?



Pupil premium parent group

NRICH exposes the same weaknesses amongst the parents as we see in the classroom –

- ❑ ability to reason
- ❑ understanding written English
- ❑ choosing strategies
- ❑ simple willingness to have a go
- ❑ fear of failure – trial & improvement
- ❑ confusion
- ❑ following instructions.



NRICH tasks lend themselves wonderfully to English language training as there is so much to draw out from a problem and discuss.

Using & Applying

Q1. Liam has five coins.

Three of the coins add up to **30p**.

Three of the coins add up to **40p**.

All five coins add up to **£1**.

What are the coins that Liam has?

p p p p p

Q2. Ben has 2 types of coin in his pocket.

He has 4 coins of one type and 2 coins of another type.

Altogether he has £1.

What two types of coins does he have?

Ben has 4 p coins and 2 p coins.

1 mark

Q3. Megan has 7 coins that make one pound.

The coins are of **only two** different kinds.

What are the 7 coins?

1 mark

Reasoning - Prove it!

Q4. Here are some sentences about an amount of money.

Mark each sentence with a tick (✓) if it is correct.
Put a cross (✗) if it is not correct.

One has been done for you.

£1.03 can be made with exactly **1** coin. ✗

£1.03 can be made with exactly **2** coins.

£1.03 can be made with exactly **3** coins.

£1.03 can be made with exactly **4** coins.

Before & Now

Perseverance

NRICH enriching mathematics

Primary

Home Students Teachers

Problem
Getting Started
Submit a solution
Teachers' Resources
Printable page

Reach 100

Stage: 2 ★★★

Here is a grid of four "boxes":

Related Collections

Working Systematically - short problems

You may also like

Number Detective

Cycling Squares

Full screen version

Cycling Squares

2 3 4 5 6 8 10 11 12 13 14 15 17 19 21 28 34 30

Can you make a circle of the numbers so that every adjoining pair adds to make a square number?

Start again

Using & Applying

Q1. Find two **square numbers** that total 45

+ = 45

Q1. 36 and 64 are both square numbers.

They have a sum of 100.

Find two **square** numbers that have a sum of **130**.

and

1 mark

20 Here are five number cards.

A A A B B

A and B stand for two **different** whole numbers.

The sum of all the numbers on all five cards is 30

What could be the values of A and B?

A = B =

1 mark

The results.

Key Stage 1:

Maths	
Level 3	**28.9%**
Level 2B+	**83%**
Level 2C+	**93.2%**

From 2014-2015

14% increase in children achieving **Level 3 in maths.**

Key Stage 2:

Level 4+	**88%**
Level 4B+	**80%**
Level 5	**41%**

From 2014-2015

19% increase in children achieving **Level 4+** in maths.
Exceeding or equalling national average in all three.

Fifteen Cards

Stage: 2 ★

I have fifteen cards numbered 1 — 15.

I put down seven of them on the table in a row.

The numbers on the first two cards add to 15.
The numbers on the second and third cards add to 20.
The numbers on the third and fourth cards add to 23.
The numbers on the fourth and fifth cards add to 16.
The numbers on the fifth and sixth cards add to 18.
The numbers on the sixth and seventh cards add to 21.

What are my cards?

Can you find any other solutions?

How do you know you've found *all* the different solutions?

Parents

7 Here are five digit cards.

0 1 4 5 8

Use **all** five digit cards to make this correct.

× 2 =

Shape Times Shape

Stage: 2 ★

The coloured shapes stand for eleven of the numbers from 0 to 12. Each shape is a different number.

Can you work out what they are from the multiplications below?

Using & Applying

Q1. Write the **three** missing numbers in this multiplication grid.

×	8	5	
4		20	28
5	40		35
3	24	15	21

Chocoholics

Stage: 2 ★★

George and Jim want to buy a chocolate bar.

George needs 2p more and Jim needs 50p more to buy it.

When they put their money together, it is still not enough to pay for the chocolate bar.

How much is the chocolate bar?