

## Leadership for Learning Project 2017-18

6<sup>th</sup> March 2018  
Tower Hamlets CPD Centre

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## Welcome to Day 4

Straight to your take-away tasks.

- Noticing
- Wondering
- Reflecting

## Teacher Takeaway

1. Try Poly Plug Rectangles and one other task to try before Day 4
2. Use your rubric to assess the tasks
3. Bring your completed rubrics to Day 4 along with any reflections/evidence
4. Read P43-53 from Transforming Primary Mathematics (Should have been the first part of Chapter 5- apologies!)

## Tasks to talk about:

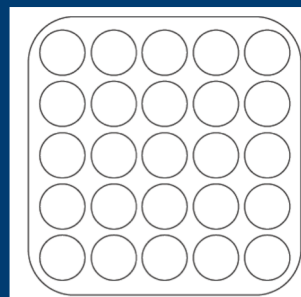
- Poly Plug Rectangles
- One is a Snail, Ten is a Crab
- Maths Story Time
- Any additional others

Now reflect on your use of the rubric in assessing each task. Share with others for richness of discussion.

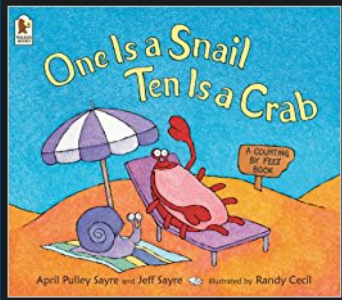
## Share revisions

- How robust was your rubric/assessment?
- What changes do you need to make and why?

## Poly Plug Rectangles (7511)



# One is a Snail, Ten is a Crab



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# Maths Story Time (9718)

### Maths Story Time

**Solving problems**

Children enjoy the challenge of being asked to help solve a problem, especially if it has big numbers and involves objects.

**Adults** could introduce story problems with a large group of three and four year olds. The story can involve sharing with the characters and a familiar number word and provide mathematical discussion, language and reasoning. Having another character come along creates a new problem and reinforces ground rules, counting, fractions, addition or subtraction.

**The Activity**

Read the book to a group of five or six. It's a golden rule, Lisa, Dog and Rabbit jump about mathematically. Can we have some more? The book has four story problems. Can the children suggest what Maths might be? Do it again.

**Encouraging mathematical thinking and reasoning**

**Questioning**  
Do a fact? How many did you get the same amount?  
Do it again?

**Reasoning**  
Why is this fact? How do you know?

**Opening up**  
What if you had more than one fact?  
Does anyone else... what should we do next?  
What would you do if you had more than one fact?  
What would you do?

**Recording**  
Could you draw a picture to show people what to do in order to be fact?

### The Mathematical Journey

**Counting**

- Counting for a purpose - to find if everyone has the same number
- Counting forwards to amounts, or counting amounts forwards
- Counting backwards to amounts, or counting amounts backwards
- Counting which numbers are more or less than others

**Adding and subtracting**

- Counting how many there will be if one more has been added
- Counting how many there will be if one more has been taken away

**Sharing**

- Sharing practically, using one-to-one and more-to-one
- Understanding how sharing results in equal shares and the same number each

**Problem solving**

- Counting objects and subdividing
- Counting sharing and subtracting to make a fact
- Counting fractions to solve a remainder problem
- Sharing objects equally
- Checking to make sure they all have the same

**Investigation and Variation**

This could start the story with Maths sharing equally, providing the children to count. The numbers chosen determine the level of challenge. It should be shared between four but, depending on the age of the children, it could be shared between two, three or five. The book includes, but not all, objects for each counting. Additionally counting numbers which involve remainders, like 1 or 3 shared between three, offers opportunities for alternative activities such as fractions, subtracting one or adding some more.

Children could be shared between four offer more challenging problem solving. The book could be shared in a similar way to each of a number but using one-to-one and more-to-one. Use a real object to be shared. This would encourage discussion of fractions, especially if there was a larger fact.

Other versions include sharing books between children or sharing resources for art work. The book could be shared in a similar way to each of a number but using one-to-one and more-to-one. Use a real object to be shared. This would encourage discussion of fractions, especially if there was a larger fact.

Other versions include sharing books between children or sharing resources for art work. The book could be shared in a similar way to each of a number but using one-to-one and more-to-one. Use a real object to be shared. This would encourage discussion of fractions, especially if there was a larger fact.

**Resources**

- Printed up by adults
- Things to count on, dot cards, tenframes
- Large numbers and dot cards
- More objects

With thanks to Ann Hedges and Steve Hedges from North London schools, who inspired the activity.

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## Reflections on reading

Thoughts?  
What did you like?  
Surprises?

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## Chapter 5 – Mathematical activity

- Goals for the collective are important as well as for individuals
- Learners can take on habits of mind by being immersed in group activity
- Reasoning as a collaborative activity rather than in individual's heads
- Focus on reasoning rather than allowing other distractions (e.g. recording)

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## Over half way now...

- Day 4 - Progression in Reasoning (contd.)
- Day 5 – Opportunities to develop the assessment of mathematical fluency
- Day 6 – Drawing it all together

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## Progression in Reasoning

- Describing
- Explaining
- Convincing
- Justifying
- Proving

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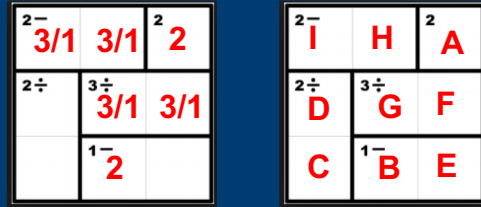
## Reasoning tasks used in 2016-17

Dacey Addition (11863)      Jig Shapes (6886)  
 Dacey Operations (6606)      Make 37 (1885)  
 Forgot the Numbers (1015)      Strike It Out (6589)  
 Heads and Feet (924)  
 Sizing Them Up (4962)  
 School Fair Necklaces (9692)  
 Three Neighbours (8108)  
 Coded Hundred Square (6554)  
 Always, Sometimes, Never (12671)  
 Reasoned Rounding (10945)



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## Ken Ken



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## Children's Thinking (13370)

"Observing children's actions whilst problem solving is key to understanding their thinking."

Here are some nursery children working creatively on the problem.



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## The Doorbell Rang (13534)

**Using Books: "The Doorbell Rang"**

Solving problems involving sharing and talking about numbers

Children often enjoy sharing a book with an adult and talking about it. Adults could provide suitable books with matching props to act them out. Here we focus on using The Doorbell Rang by Pat Hutchins, which is suitable for reception children.

**The Activity**  
 Read and enjoy The Doorbell Rang a number of times with the group. Acting out the story can be a fun way to introduce the problem. Provide a number of cookies between different numbers of people being shared (e.g. 12, 15, 18) and see how many share them out so they all have the same number.

**Discussion**  
 Ask the children to share their ideas about how to share the cookies. How many people were there? How many cookies were there? How many cookies did each person get? How many cookies were left over? How many cookies did each person get? How many cookies were left over?

**Extension**  
 What will happen if another person turns up next? Can you explain why you think that? How do Sam and Victoria know that there will be 12000 cookies each? What are you if you have 12000? How do you know you have 12000? Can you prove it? Can you share it?

**Opening up**  
 What do you think the children should do next? Do you think the number of the last doorbell? Can you explain what would happen if there were a smaller number of people? Do you think the number of people of the doorbell? Or a number of people who were not in the room? How many people were there? How many cookies were there? How many cookies did each person get? How many cookies were left over? How many cookies did each person get? How many cookies were left over?

**Recording**  
 Could you like to be a dramatist? To show Sam and Victoria could share out the 12000 cookies? Do you have any ideas about that?



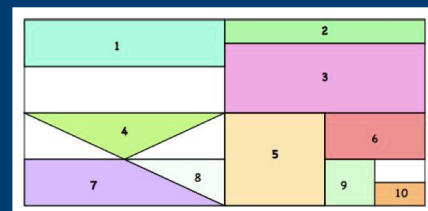
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## Children's Thinking



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## Rectangle Tangle (1048)



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WE DO NOT  
LEARN FROM  
EXPERIENCE...  
WE LEARN FROM  
REFLECTING ON  
EXPERIENCE

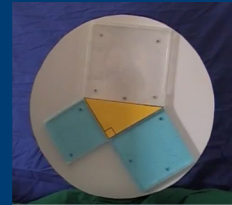
John Dewey

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## Communicating Proof

- Algebraic
- Visual
- Description

Pythagoras' theorem



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## Some types of proof accessible in primary classrooms (11463):

- Proof by exhaustion
- Proof by logical reasoning
- Generic proof
- Proof by counter-example
- Proof by contradiction

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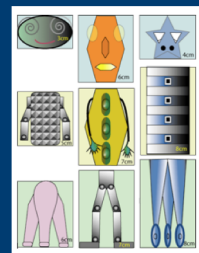
## Robot Monsters (2404)

Use the pieces to make some Robot Monsters. 1 head, 1 body and 1 legs card for each.

What are the tallest and shortest monsters you can make?

How tall is the robot monster you can make with the three pieces left over?

How many different monsters can you make with the pieces?



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## Sealed Solution (1177)

A set of ten cards, each showing a digit from 0-9 inclusive, is divided up between 5 envelopes so that there are 2 cards in each envelope.

The sum of the two numbers inside it is written on each envelope:

7   8   13   14   3

What numbers could be inside the '8' envelope?

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## Square Subtraction (8065)

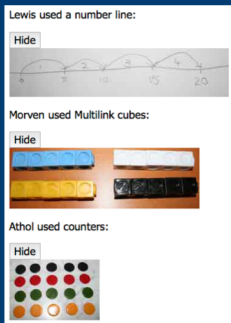
- Choose a number
- Square your chosen number
- Subtract your starting number
- Is the number you're left with odd or even?

Create a model or a picture of your calculation, and examine this model carefully.

Can you use this one model to prove that your result is always true and not just true for the particular number that you chose to start with?

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## Odd Times Even (8062)



Liz referred to this problem as offering the opportunity to use different representations, and work on a generic proof (similar to 6 Beads and Robot Monsters)

## Guess the Dominoes (6995)



The Ruler picks a card with a rule on it. The team has to find the rule on the card using the minimum number of tests. A test is asking whether a particular domino obeys the rule.

## Guess the Dominoes (6995)

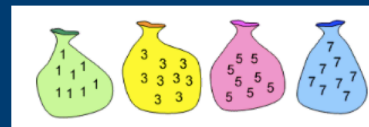
### As a team:

- Finding out what others think
- Giving reasons for ideas
- Being concise
- Reflecting on what has been said
- Allowing everyone to contribute

### Rules:

- Dominoes are chosen for testing by the team
- Only the Ruler can put a chosen domino in the 'yes box' or outside it
- The Ruler can only speak to state whether the rule the team have decided on is correct or not

## Play to 37 (10328)



## An introduction to proof by contradiction (4717)

## Some types of proof accessible in primary classrooms:

Proof by exhaustion ([Robot Monsters](#))

Proof by logical reasoning ([Sealed Solution](#))

Generic proof ([Square Subtraction](#))

Proof by counter-example ([Guess the Dominoes](#))

Proof by contradiction ([4717](#) & [Play to 37](#))

## Progression in Reasoning

- Describing
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- Proving

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## Reflecting on your reasoning rubric

- What works well?
- Is anything missing?
- What would X say?

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## Teacher Takeaway

1. Try two reasoning tasks before Day 5
2. Use your rubric to assess the tasks
3. Bring your completed rubrics to Day 5 along with any reflections/evidence
4. Read Chapter 5 of Transforming Primary Mathematics

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The screenshot shows the NRICH website interface. At the top, there is a navigation bar with links for 'Home', 'Students', 'Teachers', 'Roadshow', and 'Events'. Below this, the main heading reads 'Tower Hamlets Leadership for Learning Project 2017-18'. The content is organized into three sections, each representing a day of the project:

- Day 1: Wednesday 04 October 2017**  
Here is a pdf of the PowerPoint slides we used on the day: [20171004TH Day 1.pdf](#)  
The tasks were:  
First Product Sudoku  
Cup Transpose Digits  
Magic Ya
- Day 2: Wednesday 29th November 2017**  
Here is a pdf of the PowerPoint slides we used on the day: [20171129TH Day 2.pdf](#)  
The tasks were:  
Sardines  
Which Scores?  
Rabbit 100
- Day 3: Tuesday 9th January 2018**  
Here is a pdf of the PowerPoint slides we used on the day: [20180109TH Day 3.pdf](#)  
The tasks were:  
Rabbit 100  
Which Scores?  
Rabbit Story Time  
Poly Plug Rectangles

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## References/mentions

Craig Barton podcasts <http://www.mrbartonmaths.com/podcast/>

Cuoco, Goldenberg and Mark (1996)  
Habits of Mind: An Organizing Principle for Mathematics Curricula  
[https://nrich.maths.org/content/id/9968/Cuoco\\_et\\_al-1996.pdf](https://nrich.maths.org/content/id/9968/Cuoco_et_al-1996.pdf)

Questions and Prompts for Mathematical Thinking  
by Anne Watson and John Mason  
<https://www.atm.org.uk/Shop/Questions-and-Prompts-for-Mathematical-Thinking---PDF/dnl094>

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