

Mathematics Toolkit

Reasoning

Led by Alison Borthwick

Golden Threads

- Expand your conceptual and procedural understanding
- Raise awareness of mathematical misconceptions
- Questioning to extract reasoning and problem solving
- Connections between mathematical topics
- Language and vocabulary
- Examples of formative and summative assessment
- Ideas for using technology



Teachers will

- Explore what reasoning is;
- Consider how reasoning fits into the mathematics curriculum;
- Have a go at some activities that involve reasoning.



Homework

- Try some of the activities from the fluency session
- Reflect in particular on the role of counting in mathematics



Children:

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



Skills of reasoning



What could reasoning look like in the classroom?

- Video: [Video: Sorting and reasoning about fractions](#)
- Why does this clip contribute to children becoming reasoning?



NRICH stages of reasoning

1. Describe
2. Explain
3. Convince
4. Justify
5. Prove



Different activities that promote different skills of reasoning

- **Hundred Square**
(Logic & reasoning)
- **That Number Square!**
(A range of starting points)
- **Coded Hundred Square**
(Different strategies to solve the problem)
- **Amy's Dominoes**
(Missing information)
- **Eggs in Baskets**
(Selecting a problem solving strategy)
- **Maze 100**
(Different solutions)



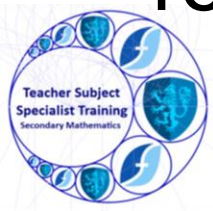
Follow up discussion

Which was your favourite activity?

Which activity promotes the most amount of reasoning?

How could you change the activities?

What is about these activities that promote reasoning?



Digging deeper: inductive reasoning

- It's a scrabble
- Amy's Dominoes



Digging deeper: deductive reasoning

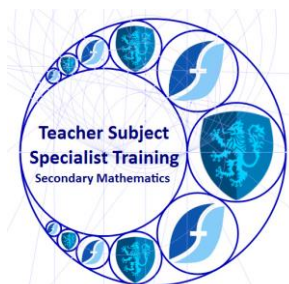
4 types of proof:-

- Proof by exhaustion: beads
- Proof by counter example: make 37
- Deductive proof: strike it out
- Generic proof: 3 consecutive numbers



How can we support children to develop reasoning?

- Modelling
- Mathematical language
- Sentence stems
- Group work
- Understanding how others work
- Personal notes & recording



How can we scaffold children to develop reasoning?

Possible questions to ask ...

- How do you know?
- How did you start?
- How could you prove it?
- What do you notice?
- Can you organise them logically to prove all the possibilities?



John Mason's

- Yourself
- A friend
- A teacher / or a skeptic



Homework

- Use one of the NRICH tasks with your pupils.
- Note down which skills of reasoning they use.



Contact Details

Rob Machin

Wymondham Contact

Contact Details

Email: machinro.staff@wymondhamcollege.org

Sophie Kardi

Farlingaye Contact

Contact Details

Email: Skardi@farlingaye.suffolk.sch.uk

