

Reasoning

Led by Becky Clinton



Golden Threads

- Conceptual understanding
- Connections between topics
- Fluency, Reasoning and problem solving
- Misconceptions in mathematics
- KS2/GCSE 9-1 Mathematics Curriculum



Homework from Session 3

- Try out some of the activities we have looked at in the fluency session

Bring back examples of work that you have done and think about how fluency was developed.

- Read Chapter 4 of the group book



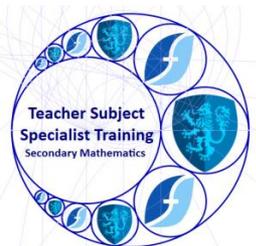
Mathematics Programme of Study: KS1-4

September 2014

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils have conceptual understanding and are able to recall and apply their knowledge rapidly and accurately to problems
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.



Reasoning



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: [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

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

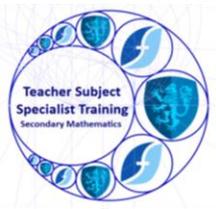
Mathematical language

Sentence stems

Group work

Understanding how others work

Personal notes & recording



How can we scaffold children to develop reasoning?

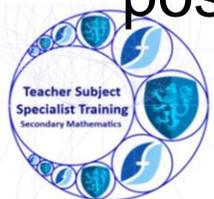
How do you know?

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

Convince -

Yourself

A friend

A teacher / or a sceptic



Reasoning characteristics

Discuss



What reasoning is not?

Reasoning is not solved just by letting children talk

Reasoning is not solely about explaining



Homework Task

Use one of the NRICH tasks with your pupils.

Note down which skills of reasoning they use.

Read chapters 2, 5 & 6 from the set book



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