Mathematical Thinking

Jess Taylor

Mark Grimmett

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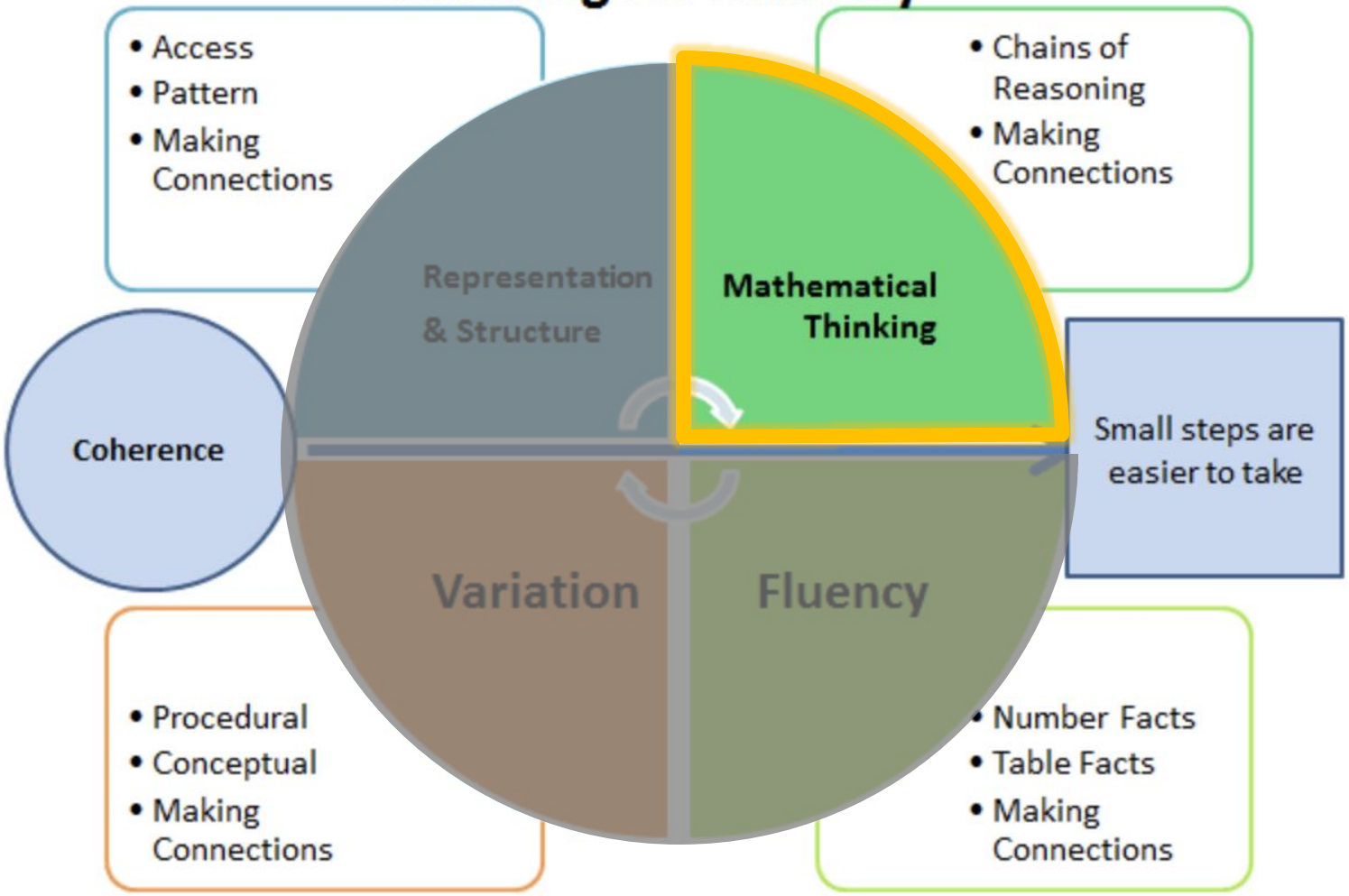
Session Aims

The NRICH 5 Stages of Reasoning

- Explore 3 Mathematical Thinking strategies
  - Withholding Information
  - Calculations
  - Chains of Reasoning
- Apply Mathematical Thinking strategies to a context

Teaching for Mastery



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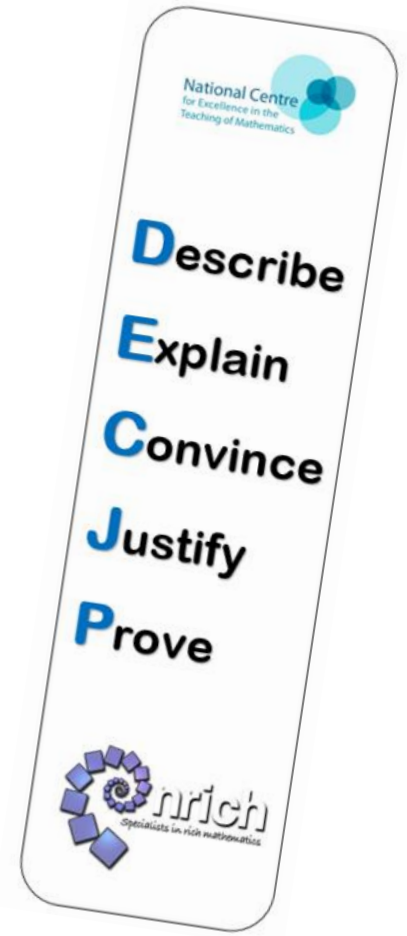
NRICH 5 Stages of Reasoning

http://nrich.maths.org/11336

NRICH (2014)

1. • **Describing**: simply tells what they did.
2. • **Explaining**: offers some reasons for what they did. These may or may not be correct. The argument may yet not hang together coherently.
3. • **Convincing**: confident that their chain of reasoning is right and may use words such as, 'I reckon' or 'without doubt'.
4. • **Justifying**: a correct logical argument that has a complete chain of reasoning to it and uses words such as 'because', 'therefore', 'and so', 'that leads to' ...
5. • **Proving:** a watertight argument that is mathematically sound, often based on generalisations and underlying structure.



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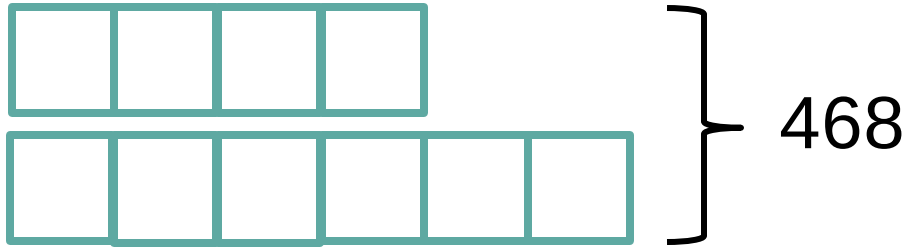
Calculations

1



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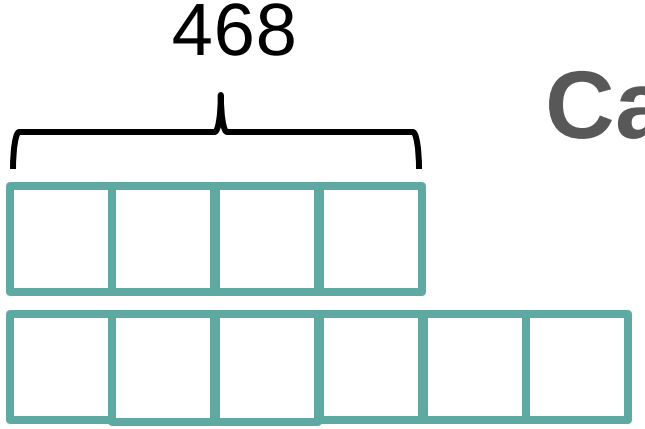

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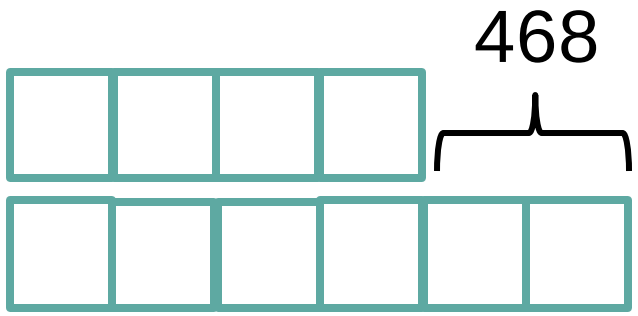

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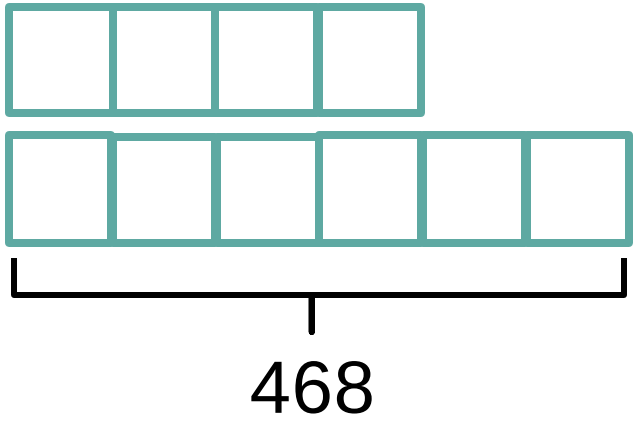

A $\frac{468}{4}$

B $\frac{468}{2}$

C $\frac{468}{10}$

D $\frac{468}{6}$

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Withholding Information

Mae Adam a Matt yn rhannu arian yn y gymhareb 4 : 6

Caiff £468

P'run o'r rhain yw cyfanswm yr arian sy'n cael ei rannu?

Can you work out a question that would give each of these answers?

A	B	C	D
£234	£1170	£936	£117

Are there any other questions that could give different answers?

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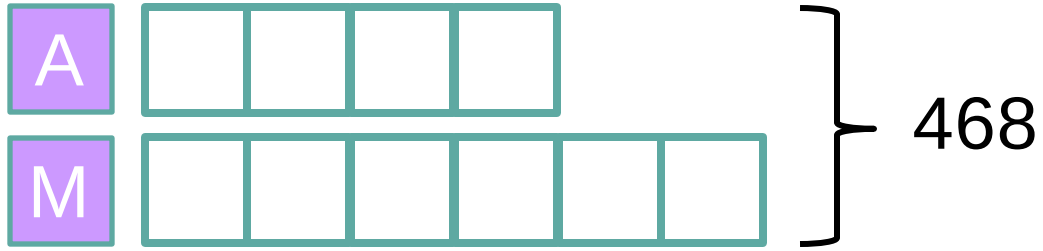
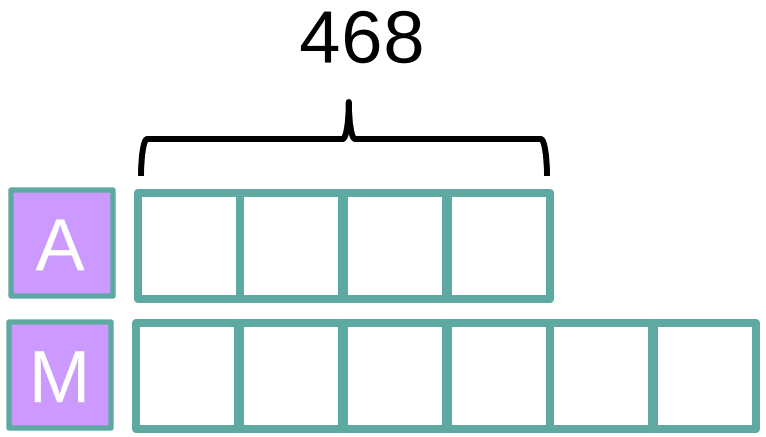
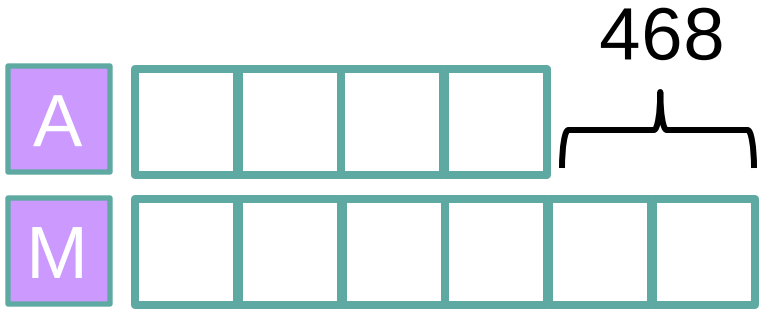
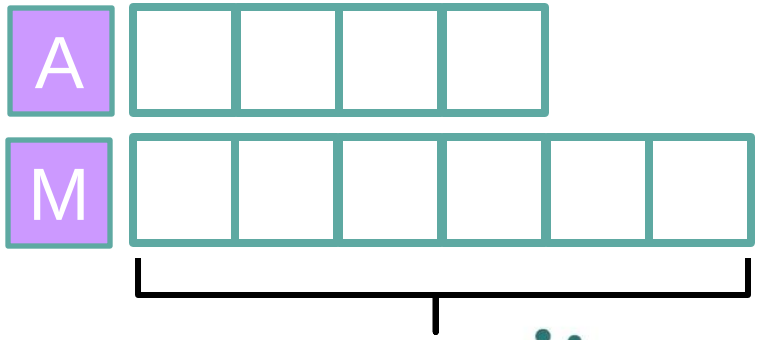
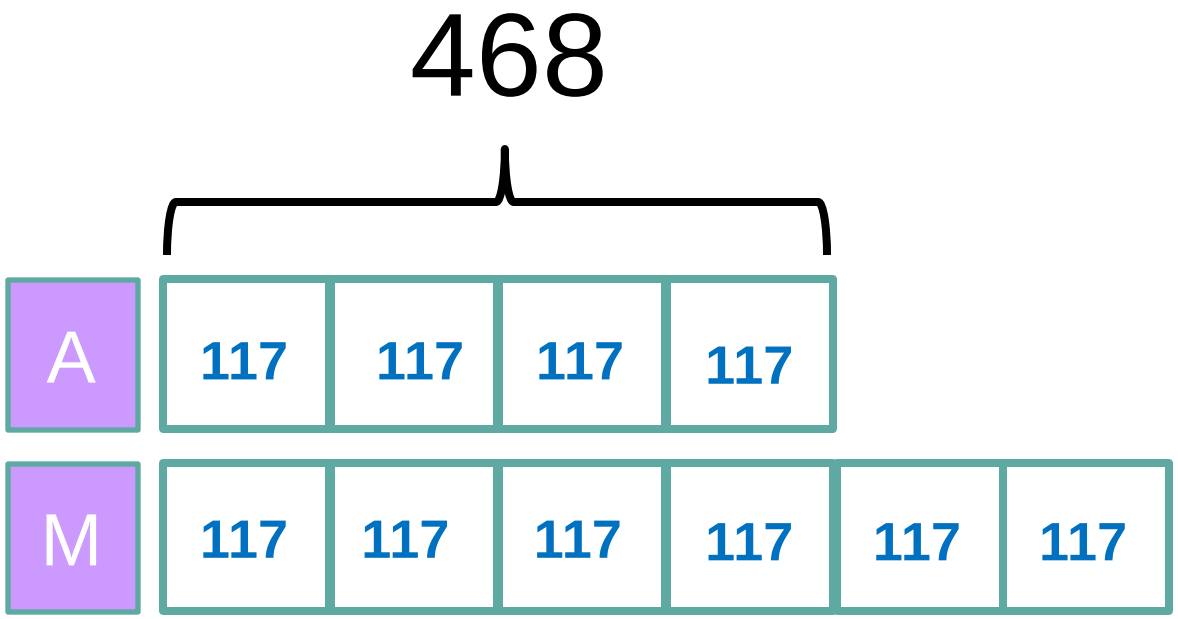








Chains of Reasoning



What else can we calculate?

Calculations

$$\frac{468}{4} = 117$$

$$117 \times 4 = 468$$

$$117 \times 6 = 702$$

$$468 + 702 = 1170$$

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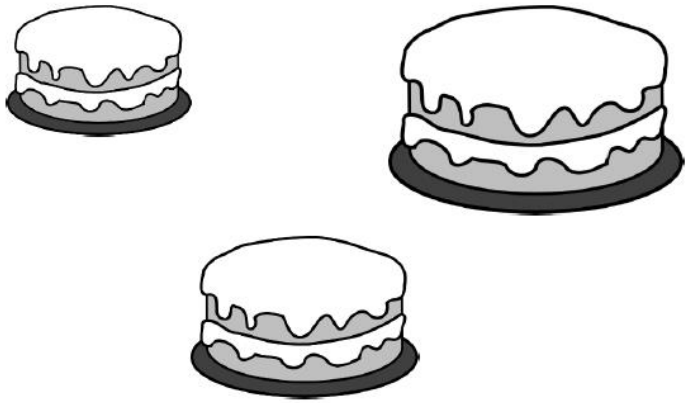
Goal-Free Problems

http://goalfreeproblems.blogspot.com/

https://www.jaggersmaths.co.uk/goal-free-problems

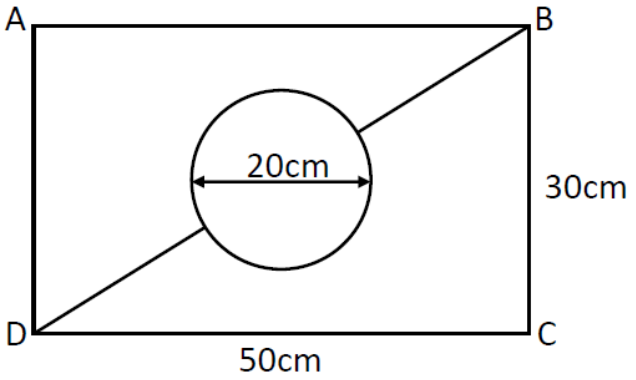
A bakery bakes small, medium and large cakes.

The ratio small : medium : large is 3 : 5 : 2.



find everything you can from this information!

The diagram shows a rectangle ABCD with a circle drawn at the centre.



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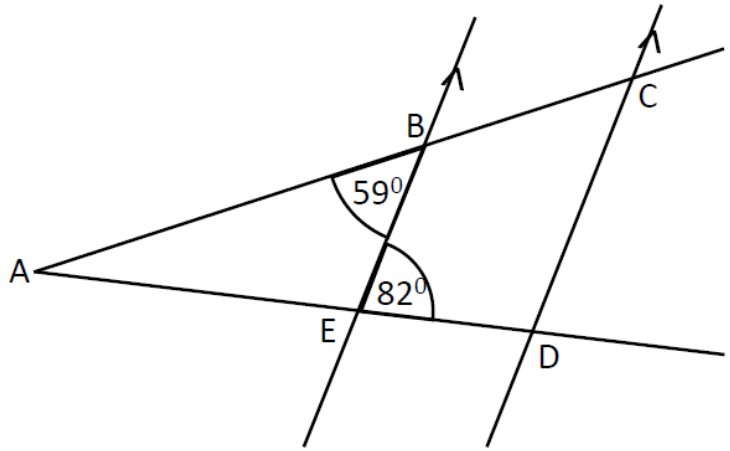
The diagram shows a pair of parallel line and some angles marked between them.



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How could you apply the strategies to these examples?

- Withholding Information
- Calculations
- Chains of Reasoning

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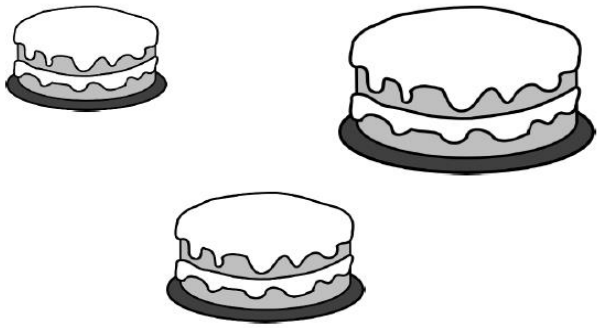

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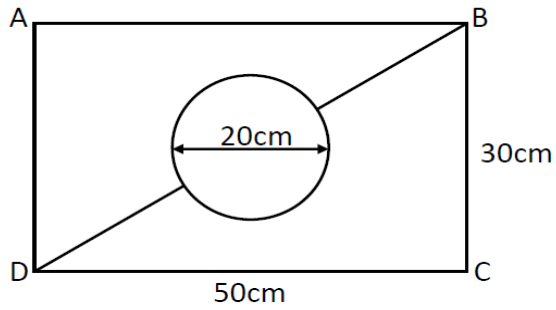

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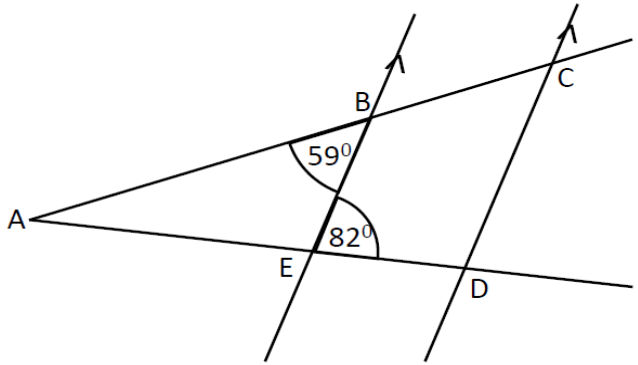

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Thank you.

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Session Aims

- ✓ Understand the NRICH 5 Stages of Reasoning
- ✓ Explore 3 Mathematical Thinking strategies
  - ✓ Withholding Information
  - ✓ Chains of Reasoning
  - ✓ Calculations
- ✓ Discover the importance of 'goal-free problems'
- ✓ Apply Mathematical Thinking strategies to a context