



Leadership for Learning Day 4: Mastery in the Primary Mathematics Curriculum

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Aims of the Day

- To deepen our own understanding of what might be meant by 'mastering mathematics'
- To discuss how we can help children 'master' mathematics
- To consider how to support colleagues in developing mastery in their classrooms.

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Outline of the Day

9.30-9.35	Welcome
9.35-10.15	Working on a mathematical task together
10.15-10.45	Mastery with NRICH
10.45-11.00	Break
11.00-11.30	Feedback from work in schools
11.30-11.55	Mastery with NRICH cont.
11.55-12.15	Mastery from an NCETM perspective
12.15-1.00	Lunch
1.00-1.30	Working on a mathematical together
1.30-1.40	Sharing plans for, and follow up from, staff meetings
1.40-2.45	Mastery with NRICH cont.
2.45-3.15	Curriculum development work
3.15-3.30	Plenary

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Don't forget ...

<http://nrich.maths.org/leadershipharingey>

A page on the NRICH site devoted to this project

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What do you understand by the phrase 'mastering Mathematics'?

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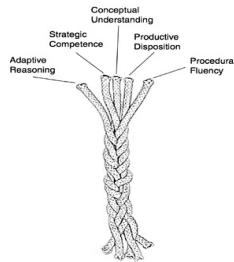


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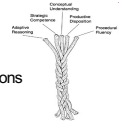


NRICH: Working like a Mathematician



From NRC (2001) *Adding it up: Helping children learn mathematics*

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Conceptual understanding:
comprehension of mathematical concepts, operations, and relations

Procedural fluency:
skill in carrying out procedures flexibly, accurately, efficiently, and appropriately

Strategic competence:
ability to formulate, represent, and solve mathematical problems

Adaptive reasoning:
capacity for logical thought, reflection, explanation, and justification

Productive disposition:
habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy.

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Reach 100 (1130)

You must choose four **different** digits from 1 – 9 and put one in each box. For example:

5	2
1	9

This gives four two-digit numbers:

52 (reading along the 1st row)
19 (reading along the 2nd row)
51 (reading down the left hand column)
29 (reading down the right hand column)

In this case their sum is 151.

Your challenge is to find four **different** digits that give four two-digit numbers which add to a total of 100.

How many ways can you find of doing it?



Experiences in School

- What did you/your colleagues do? (task, age group, did you work with a colleague?)
- What went well?
- Were there any surprises?
- What would you do differently next time?

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Developing Mathematical Habits of Mind (11864)

Children learn better when they are curious, thoughtful, determined and collaborative.

Here are some collections of mathematical activities designed to give Stage 1 and 2 learners opportunities to develop these desirable characteristics.



Being Curious - Primary
These problems will exploit primary learners' natural curiosity and provoke them to ask good mathematical questions.



Being Thoughtful - Primary
These problems require careful consideration. Allow your learners time to become absorbed in them. They are designed to help primary children develop the habit of being thoughtful.



Being Collaborative - Primary
These problems are ideal for primary school children to work on with others. Encourage your learners to share ideas, and recognise that two heads can be better than one.



Being Determined - Primary
These problems require determination for primary school children. Encourage your learners to persevere - there's often a great sense of achievement when we've had to struggle.

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NCETM and Mastery

- Feb 2014 – initial visit to China
- Two National Collaborative Project with Maths Hubs:
England/China exchange programme
Trialling mastery textbooks supported by CPD

From NCETM Roundtable event, December 2015

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England-China Exchange Programme

- NCETM directors visited China and worked with Chinese teachers (Aug/Sept 2014)
- English primary teachers visited China (~70 teachers, Sept 2014)
- Chinese primary teachers visited England and taught mathematics (two waves, Nov 2014, Feb 2015, ~35 teachers each time)

From NCETM Roundtable event, December 2015

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The NCETM and Mastery: Widening the Reach

- NCP 5: Primary Maths Teaching for Mastery Specialists programme – training 140 teachers, four per Maths Hub
- DfE Primary Maths Teaching for Mastery working group – first meeting September 2015, met for the second time in December
- Identifying exemplification of effective implementation of maths teaching for mastery approaches in English schools

From NCETM Roundtable event, December 2015

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Mastering Mathematics: NCETM Definition

Acquiring deep and lasting procedural and conceptual understanding, so enabling progress to be made through the curriculum

- Being mathematically fluent (definition to follow)
- Seeing connections
- Being able to reason mathematically
- Being able to solve non-routine problems
- Being confident about, and having a positive disposition towards, maths

From NCETM Roundtable event, December 2015

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NCETM: Teaching for Mastery

- Devoting more time to introduction of key concepts
- Focusing on one key idea only per lesson
- Keeping the whole class together
- Concentrating on pupils' thinking (as well as doing)
- Anticipating difficult points and misconceptions
- Choosing representations and models carefully
- Planning questioning carefully
- Expecting and supporting precise explanations and reasoning from pupils
- Applying variation theory
- Intervening quickly to support those falling behind

From NCETM Roundtable event, December 2015

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To Find Out More ...

NCETM's Mastery microsite

<http://www.ncetm.org.uk/resources/47230>

NB The NCETM's insight and understanding are continually developing

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Five Myths of Mastery

The National Association of Mathematics Advisors (NAMA) has published a document which discusses five specific false ideas that have circulated about mastery in mathematics:

<http://www.nama.org.uk/Downloads/Five%20Myths%20about%20Mathematics%20Mastery.pdf>

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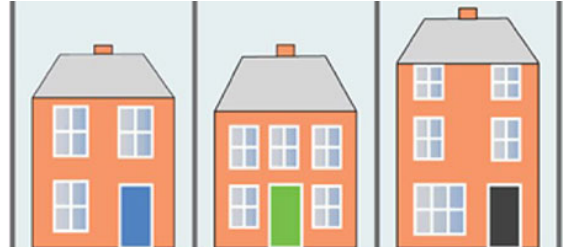
Staff Meetings

'Developing a Classroom Culture that Supports a Problem-solving Approach to Mathematics' article by Jennie Pennant
<http://nrich.maths.org/10341>

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Guess the Houses (6983)



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Reflections

- What will you take away from today that will change what you do back at school?
- What will change
 - your own practice?
 - that of the whole school?

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Further NRICH Support

Developing Mathematical Habits of Mind (being curious, thoughtful, collaborative and determined)
<http://nrich.maths.org/11864> (in development)

Mastering Mathematics: Developing Generalising and Proof Feature
<http://nrich.maths.org/11458>

Mastering Mathematics and Problem Solving article
<http://nrich.maths.org/11796>

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References

Cuoco, A., Goldenberg, E.P. & Mark, J. (1996) 'Habits of Mind: An Organizing Principle for Mathematics Curricula.' *Journal of Mathematical Behavior* **15** 375-402.

Kilpatrick, J. Swafford, J. & Findell, B. (eds.) (2001). *Adding it up: Helping children learn mathematics*. Mathematics Learning Study Committee: National Research Council.

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