



## Leadership for Learning Day 3: Fluency in the Primary Mathematics Curriculum

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## Aims of the Day

- To deepen our own understanding of what is meant by 'fluency'
- To discuss how we can help children become more fluent in mathematics
- To consider how to support colleagues in developing fluency 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	Fluency with NRICH
10.45-11.00	Break
11.00-11.45	Feedback from work in schools
11.45-12.15	Fluency with NRICH cont.
12.15-1.00	Lunch
1.00-1.20	Working on a short task together
1.20-1.30	Considering possible staff meetings
1.30-1.40	Short reflection
1.40-2.45	Fluency 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/leadershiparingey>

A page on the NRICH site devoted to this project

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## National Numeracy Strategy Interactive Teaching Program Number Grid

[http://www.taw.org.uk/lic/itp/itps/number\\_grid\\_4\\_0.swf](http://www.taw.org.uk/lic/itp/itps/number_grid_4_0.swf)

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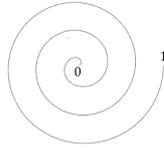
How would you define fluency?

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## Spiralling Decimals (10326)



0.5	0.25	0.75	0.3
0.35	0.9	0.99	0.999
0.1	0.01	0.05	1.79
0.64	0.32	0.54	0.865

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- What is the mathematical knowledge that is needed to play?
- Who would this game be for?
- What is the 'value added' of playing the game for high-attaining/low-attaining children?
- How could you adapt this game to use it in your classroom?

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## 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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## National Curriculum

Become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

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Become fluent in the **fundamentals** of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop **conceptual understanding** and the ability to **recall and apply knowledge** rapidly and accurately.

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## What Does the Research Say About Fluency?

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### Efficiency

An efficient strategy is one that the student can carry out easily, keeping track of sub-problems and making use of intermediate results to solve the problem.

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### Efficiency

### Accuracy

depends on careful recording, the knowledge of basic number combinations and other important number relationships, and checking results.

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### Efficiency

### Accuracy

### Flexibility

requires the knowledge of more than one approach and being able to choose appropriately between them

(Russell, 2000 [http://investigations.terc.edu/library/bookpapers/comp\\_fluency.cfm](http://investigations.terc.edu/library/bookpapers/comp_fluency.cfm))

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## Fluency

Procedural without conceptual	Conceptual without procedural
Computation without meaning	Computation which is slow, effortful and frustrating
Inability to adapt skills to unfamiliar contexts	Inability to focus on the bigger picture when solving problems
Difficulty reconstructing forgotten knowledge or skills	Difficulty progressing to new or more complex ideas

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## Playing Incey Wincey Spider

<http://nrich.maths.org/early-years>

**The Incey Wincey Spider Game**

**Incey Wincey Spider**  
Climbing up the spout;  
Down came the rain  
And washed the spider out.  
Out came the sunshine  
And dried up all the rain;  
Incey Wincey spider  
Climbing up again.

**A game for two players**  
One of you is the sunshine  
and one of you is the rain.  
Throw a dice to see how far you go.  
The sunshine makes the spider  
go up the drain pipe.  
The rain makes it go down.  
If you get right to the end, you win.  
Who won?

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## Number Match 6937

A grid of 12 boxes for a number matching activity. The boxes contain:
 

- Top-left: 6 dots
- Top-middle: A pentagon
- Top-right: A 2x5 grid with 3 shaded squares in the top row and 2 in the bottom row
- Middle-left: A 2x5 grid with 3 shaded squares in the top row and 2 in the bottom row
- Middle-middle: 3 dots
- Middle-right: The word "Three"
- Bottom-left: A 2x5 grid with 3 shaded squares in the top row and 2 in the bottom row
- Bottom-middle: A triangle
- Bottom-right: The word "Five"
- Far-bottom-left: A pentagon
- Far-bottom-middle: 4 dots
- Far-bottom-right: The number "4"
- Far-bottom-far-right: The number "6"

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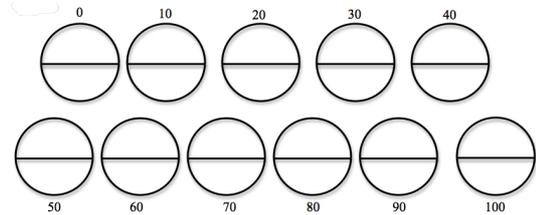
How does this activity help children to become more fluent?

How could you adapt this activity to use in your own classroom?

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## Reasoned Rounding (10945)



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## Factors and Multiples Game (5468)

This is a game for two players.

The first player chooses a number on the grid and crosses it out.

The second player chooses a number to cross out. The number must be a factor or multiple of the first number.

Players continue to take it in turns to cross out numbers, at each stage choosing a number that is a factor or multiple of the number just crossed out by the other player.

**The first person who is unable to cross out a number loses.**

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## Four Go (5633)



100	25	5
10	2	36
12	4	3



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## 'Being Fluent'

At NRICH, we believe that 'being fluent' means being fluent with:

- Facts
- Calculation strategies
- Concepts
- Representations
- Using mathematical content in new contexts
- Making connections across mathematical content
- Problem-solving strategies
- If I know this, then I know that ...

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## And Finally ...

We have considered four versions of fluency:

- Our own
- From the National Curriculum
- From research
- From NRICH

What implications does this have for you back at school?

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## NRICH Support

### Number Fluency Feature

<https://nrich.maths.org/10821>

The feature brings together tasks which promote numerical fluency in an engaging way

The article <https://nrich.maths.org/10624> looks at the meaning of fluency in the context of number, and how it can often be unintentionally misinterpreted

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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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## Future Date

Wednesday 25 May (last day)

Leadership for Learning – Mastery in the Primary Mathematics Curriculum

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