

UNIVERSITY OF CAMBRIDGE

# Nurturing Successful Mathematicians

Welcome  
We will get started in a few moments

We will be recording today's event so please turn off your microphone and camera

[nrich.maths.org/code-of-conduct](http://nrich.maths.org/code-of-conduct)

nrich.maths.org  
© University of Cambridge

1

UNIVERSITY OF CAMBRIDGE

# Nurturing Successful Mathematicians

NRICH Live - Primary  
7 October 2020

Liz Woodham  
Charlie Gilderdale

nrich.maths.org  
© University of Cambridge

2

nrich.maths.org  
© University of Cambridge

3

## Five Strands of Mathematical Proficiency

Kilpatrick, J. et al (2001) *Adding It Up: Helping Children Learn Mathematics*

nrich.maths.org  
© University of Cambridge

4

**Understanding** - Maths is a network of linked ideas. I can connect new mathematical thinking to what I already know and understand.

**Tools** - I have a toolkit that I can choose tools from to help me solve problems. Practising using these tools helps me become a better mathematician.

**Problem solving** - Problem solving is an important part of Maths. I can use my understanding, skills and reasoning to help me work towards solutions.

**Reasoning** - Maths is logical. I can convince myself that my thinking is correct and I can explain my reasoning to others.

**Attitude** - Maths makes sense and is worth spending time on. I can enjoy Maths and become better at it by persevering.

Adapted from Kilpatrick, J. et al (2001) *Adding It Up: Helping Children Learn Mathematics*

nrich.maths.org  
© University of Cambridge

5

nrich.maths.org  
© University of Cambridge

6

NRICH

Primary Secondary Early Primary Secondary  
Students Students Years Teachers Teachers

Events Donate

### Past Features

Published August 2012.

**A Flexible Approach to Calculating**  
Age 5 to 11  
The tasks in this feature are designed to help young learners to make and justify decisions on the method they use to solve a calculation.

**Nurturing Successful Mathematicians**  
Age 5 to 11  
In this feature, we offer sets of linked tasks which will help develop learners as mathematicians.

**Maths at Home**  
Age 5 to 11  
This feature is packed with activities and games for learners to work on at home, without a teacher.

**Compare to Pair**  
Age 5 to 11  
This feature offers interactive 'matching pairs' games which will help learners understand equivalence in a variety of contexts.

**Cuisenaire**  
Age 5 to 11  
The tasks in this feature use Cuisenaire rods to help learners visualize and explore the links to be made between proportionality, equivalence, comparison, difference and pattern.

**Low Threshold High Ceiling**  
Age 5 to 11  
The low threshold high ceiling activities in this feature are ideal for supporting and challenging whole classes.

nrich.maths.org  
© University of Cambridge

7

NRICH

Primary Secondary Early Primary Secondary  
Students Students Years Teachers Teachers

Events Donate Roadshow PD

### Nurturing Successful Mathematicians

In this feature, we are offering you groups of linked tasks which will help develop learners as mathematicians. We have created a [class-friendly model](#), which we hope you will share with your learners as they work on the tasks, to encourage them to reflect on their own mathematical capabilities.

**Maths at Home - Nurturing Successful Mathematicians**  
Age 5 to 16  
This short article explores what successful mathematicians do and suggests how we can support young people when many are learning at home.

**From Exploration to Consolidation**  
Age 5 to 11  
Each pair of tasks in this group offers an opportunity to put into practice the model of 'exploration, codification, consolidation'. Take a look to find out more.

**From Competitive to Collaborative**  
Age 5 to 11  
Each of these tasks has been structured in the same way to make the most of a shift from a competitive to a collaborative challenge.

**From Random to Systematic**  
Age 5 to 7  
The tasks in this group invite learners to find all possible solutions so are a perfect context for working systematically.

**Deeper Understanding**  
Age 5 to 11  
These tasks all offer opportunities to explore and describe number patterns, particularly using knowledge of factors and multiples.

Related: [Nurturing Successful Mathematicians](#)

nrich.maths.org  
© University of Cambridge

8

nrich.maths.org  
© University of Cambridge

9

1. Score your own game and post your total number of points in the chat.

2. Can you recreate an arrangement of the digits that would result in someone else's point total?

3. How could you arrange the same digits (shown above) to maximise your score? (Please share your reasoning in the chat but don't include the total that you think is the maximum!)

4. Imagine playing this game with your class. Please post in the chat any comments or questions that you think might come up.

nrich.maths.org  
© University of Cambridge

10

**Understanding** - Maths is a network of linked ideas. I can connect new mathematical thinking to what I already know and understand.

**Tools** - I have a toolkit that I can choose tools from to help me solve problems. Practising using these tools helps me become a better mathematician.

**Problem solving** - Problem solving is an important part of Maths. I can use my understanding, skills and reasoning to help me work towards solutions.

**Reasoning** - Maths is logical. I can convince myself that my thinking is correct and I can explain my reasoning to others.

**Attitude** - Maths makes sense and is worth spending time on. I can enjoy Maths and become better at it by persevering.

Adapted from Kilpatrick, J. et al (2001) *Adding It Up: Helping Children Learn Mathematics*

nrich.maths.org  
© University of Cambridge

11

## Less Is More

([nrich.maths.org/less-is-more](http://nrich.maths.org/less-is-more))

NRICH

Primary Secondary Early Primary Secondary  
Students Students Years Teachers Teachers

Events Donate

### Less Is More

Age 5 to 11 +

**Teachers' Resources** [activity here](#) can be used to simulate a partner and a 0-9 dice.

Each of you draw some cells that look like the picture below. (You don't have to make the cells on the left a different colour, but we will refer to those cells later.) Alternatively, you could print off [this sheet](#) of cells.

**You may also like**

- Writing Digits** Use any writing of the counting number from 1 to 20. One response for a row after writing overwriting digits. What was the last number you wrote?
- Number Detective** Follow the clues to find the mystery number.
- Six Is the Sum** Look at the digits in the number fifteen add up to 10. How many other numbers have digits with the same total but no zero?

**Version 1**

Take turns to throw the dice. After each throw of the dice, you each decide which of your cells to put that number in.

Throw the dice eight times until all the cells are full and you have created four two-digit numbers.

If both of your number sentences are correct, you score a total of the two numbers written in the four blue boxes.

nrich.maths.org  
© University of Cambridge

12

## Strike It Out

(nrich.maths.org/strike-it-out)

nrich.maths.org  
© University of Cambridge

13

## Strike It Out

(nrich.maths.org/strike-it-out)

nrich.maths.org  
© University of Cambridge

14

## Strike It Out

(nrich.maths.org/strike-it-out)

nrich.maths.org  
© University of Cambridge

15

## Competitive to Collaborative

1. Try to create a string of calculations that uses as many numbers as possible on the 0-20 number line.  
*Please post in the chat how many numbers are unused.*
2. Is it possible to create a string of number sentences that uses all the numbers on the 0-20 number line? Why, or why not?

nrich.maths.org  
© University of Cambridge

16

**Understanding** - Maths is a network of linked ideas. I can connect new mathematical thinking to what I already know and understand.

**Tools** - I have a toolkit that I can choose tools from to help me solve problems. Practising using these tools helps me become a better mathematician.

**Problem solving** - Problem solving is an important part of Maths. I can use my understanding, skills and reasoning to help me work towards solutions.

**Reasoning** - Maths is logical. I can convince myself that my thinking is correct and I can explain my reasoning to others.

**Attitude** - Maths makes sense and is worth spending time on. I can enjoy Maths and become better at it by persevering.

Adapted from Kilpatrick, J. et al (2001) *Adding It Up - Helping Children Learn Mathematics*  
nrich.maths.org  
© University of Cambridge

17

## Strike It Out

(nrich.maths.org/strike-it-out)

nrich.maths.org  
© University of Cambridge

18

Primary Secondary Early Primary Secondary  
Students Students Years Teachers Teachers

Topics Search NRICH GO

Events Donate Roadshow PD

### Nurturing Successful Mathematicians

In this feature, we are offering you groups of linked tasks which will help develop learners as mathematicians. We have created a **class-friendly** model, which we hope you will share with your learners as they work on **tasks**, to encourage them to reflect on their own mathematical

**Maths at Home - Nurturing Successful Mathematicians**  
Age 5 to 16

This short article for teachers and parents explores what it means to be a successful mathematician, and suggests how we can support young people at time when many are learning at home.

**From Exploration to Consolidation**  
Age 5 to 11

Each pair of tasks in this group offers an opportunity to put into practice the model of 'exploration, codification, consolidation'. Take a look to find out more.

**From Random to Systematic**  
Age 5 to 7

The tasks in this group invite learners to find all possible solutions to are a perfect context for working systematically.

**From Introduction to Deeper Understanding**  
Age 5 to 11

These tasks all offer opportunities to explore and describe number patterns, particularly using knowledge of factors and multiples.

Related Nurturing Successful Mathematicians

nrich.maths.org  
© University of Cambridge

19

Topic: Number Reasoning: PD

### Maths at Home - Nurturing Successful Mathematicians

Our latest feature for primary and secondary students has been inspired by the concept of 'maths at home' which was introduced in October 2020. This idea was developed to support learners during periods of school closure, which allowed them to continue to engage with mathematics in their own homes. We have now created a new model for 'maths at home' which is designed to be more effective and to support learners in a more meaningful way.

We have developed a new model and page which use 'class-friendly' language, so that teachers and parents can share this model with their learners. This model is designed to be used in a variety of ways, including as a model for 'maths at home' or as a model for 'maths at school'.

**Understanding** - Maths is a way of thinking, not just a set of facts to be memorised. It is a way of thinking that involves exploring, questioning, and reasoning. It is a way of thinking that is used in all areas of life.

**Tools** - I have a book that I can share with you to help you understand the model of 'exploration, codification, consolidation'. This book is designed to be used in a variety of ways, including as a model for 'maths at home' or as a model for 'maths at school'.

**Reasoning** - Maths is logical. I can convince myself that my thinking is sound and can explain my reasoning to others.

**Attitude** - Maths makes sense and is worth spending time on. I can enjoy Maths and become better at it by practising.

This addition of the new model is inspired by Kilpatrick et al. (2001), and the intention is to support learners in a more meaningful way. The model is designed to be used in a variety of ways, including as a model for 'maths at home' or as a model for 'maths at school'.

**Maths at Home - Nurturing Successful Mathematicians**  
Age 5 to 16

This short article for teachers and parents explores what it means to be a successful mathematician, and suggests how we can support young people at time when many are learning at home.

**From Exploration to Consolidation**  
Age 5 to 11

Each pair of tasks in this group offers an opportunity to put into practice the model of 'exploration, codification, consolidation'. Take a look to find out more.

**From Random to Systematic**  
Age 5 to 7

The tasks in this group invite learners to find all possible solutions to are a perfect context for working systematically.

**From Introduction to Deeper Understanding**  
Age 5 to 11

These tasks all offer opportunities to explore and describe number patterns, particularly using knowledge of factors and multiples.

Related Nurturing Successful Mathematicians

nrich.maths.org  
© University of Cambridge

20

[nrich.maths.org/14718/note](http://nrich.maths.org/14718/note)

	Understanding	
	Tools	
	Problem solving	
	Reasoning	
	Attitude	

Adapted from Kilpatrick, J. et al (2001) *Adding It Up: Helping Children Learn Mathematics*

nrich.maths.org  
© University of Cambridge

21

#nrichLIVE

@nrichmaths

[www.nrich.maths.org/newsletter](http://www.nrich.maths.org/newsletter)

[www.nrich.maths.org/14759](http://www.nrich.maths.org/14759)

<https://tinyurl.com/primary-nrich-live-feedback>

nrich.maths.org  
© University of Cambridge

22