

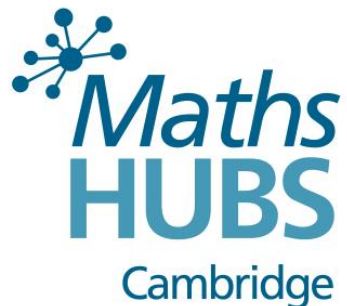
# Problem Solving and Reasoning

session 2

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# Aims of the 3 sessions

- ▶ Session 1 - What is NRICH?  
NRICH as a tool for planning and teaching. Problem solving and reasoning in the National Curriculum.  
Gap Task.
- ▶ Session 2 - Reflection on the Gap Task.  
NRICH planning looking at your medium term plan, adapting to incorporate fluency and reasoning.  
Second Gap Task.
- ▶ Session 3 - Reflection on the Second Gap Task.  
Understanding the different types of problem solving.  
Ways forward.

# Aims of the Session

- ▶ To reflect on the Gap Task and share thoughts.
- ▶ To look at NRICH planning using your medium term plan, adapting to incorporate fluency and reasoning.
- ▶ To be given a second Gap Task linked to the session.

# Multiplication Squares

► <http://nrich.maths.org/1134>

In the  $2 \times 2$  multiplication square below, the boxes at the end of each row and the foot of each column give the result of multiplying the two numbers in that row or column.

7	5	35
3	4	12
21	20	

The  $3 \times 3$  multiplication square below works in the same way. The boxes at the end of each row and the foot of each column give the result of multiplying the three numbers in that row or column.

			15
			108
			224
144	8	315	

The numbers 1 – 9 may be used once and once only.

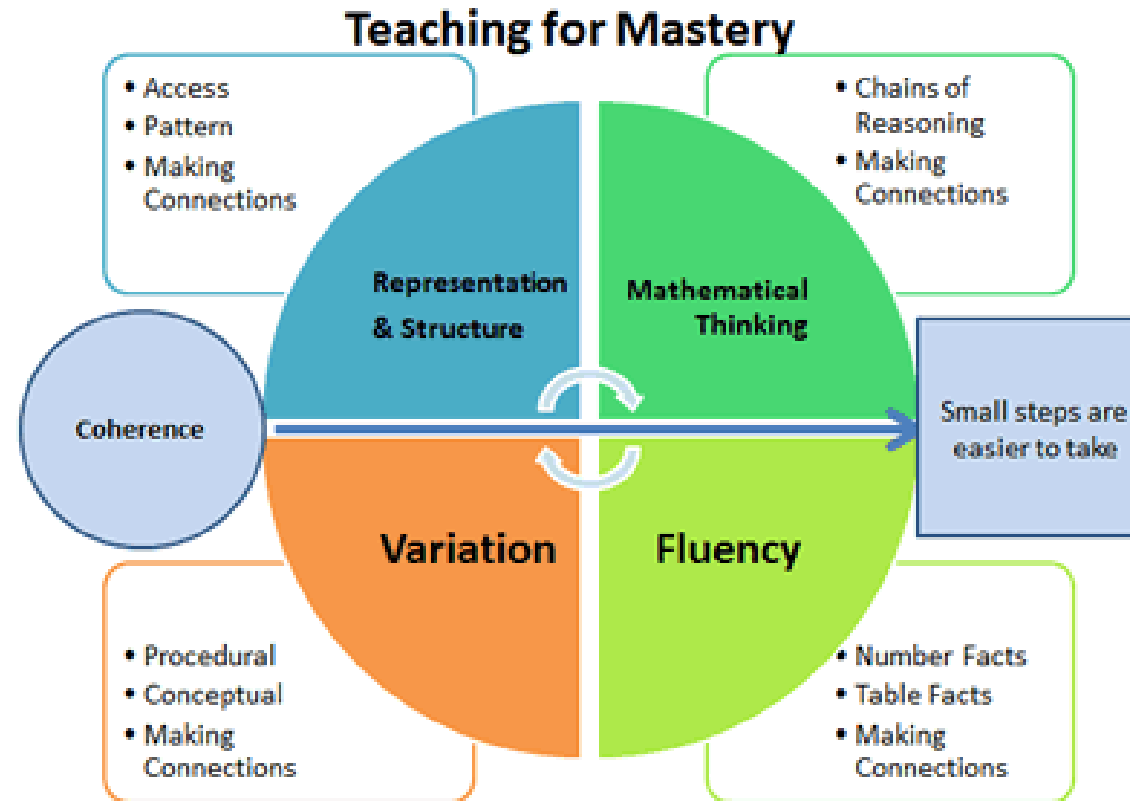
Can you work out the arrangement of the digits in the square so that the given products are correct?

# Gap Task

- ▶ How did you get on?
  - ▶ What year group?
  - ▶ Which activity? How did you adapt it?
  - ▶ Did it go well?
  - ▶ Did anything not go well?
  - ▶ How would you change it to use it again?
  - ▶ Children's views.

# 5 big ideas

- ▶ Fluency
- ▶ Variation
- ▶ Representation and structure
- ▶ Mathematical thinking
- ▶ Coherence



- ▶ NCETM: <https://www.ncetm.org.uk/resources/50042>

# Linking the 5 Big Ideas

- ▶ Now we are going to look at linking the 5 big ideas to some NRICH tasks.
- ▶ Try the NRICH tasks - Which 5 big ideas do they relate too? Is one task better than another for covering more of the big ideas?
- ▶ Share thoughts

# Coded Hundred Square

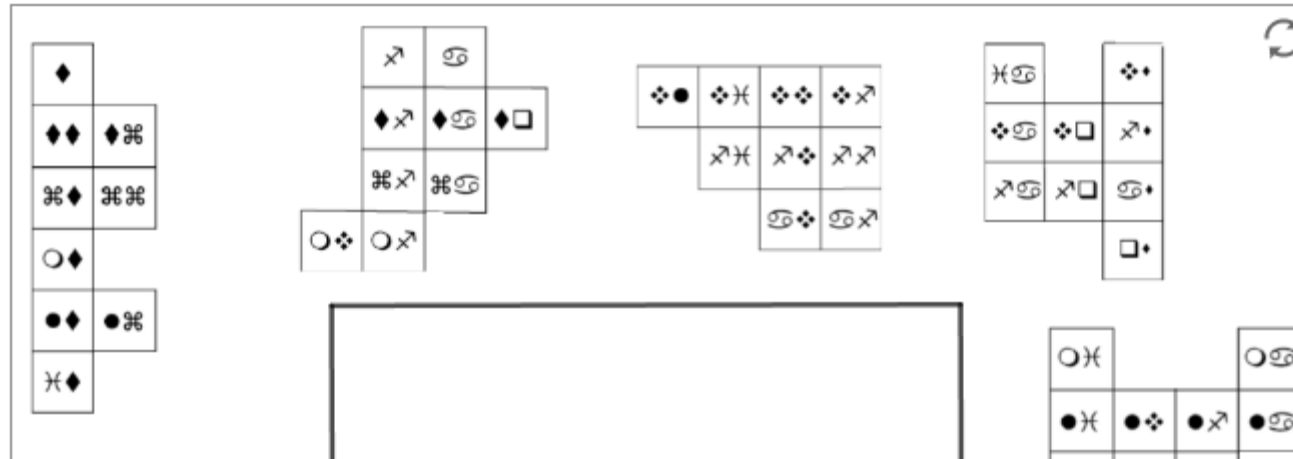
► <http://nrich.maths.org/6554>

This hundred square is written in code.

It starts with one and ends with a hundred.

Can you build it up?

You can use the interactivity below or print and cut out the pieces from [these sheets](#).

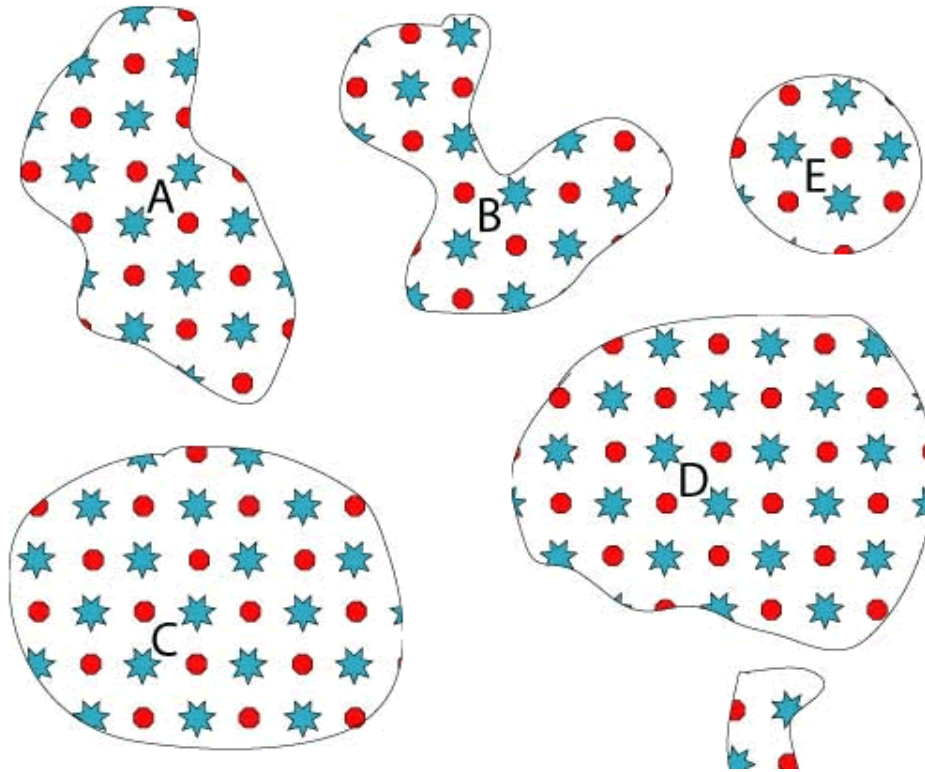




# Wallpaper

► <http://nrich.maths.org/4964>

Arrange these pieces of wallpaper in order of size. Put the smallest first.



# Five Steps to 50

► <http://nrich.maths.org/10586>

This challenge is about counting on and back in steps of 1, 10 and 100.

Roll a dice twice to establish your starting number - the first roll will give you the tens digit and the second roll will give you the units digit.

You can then make five jumps to get as close to 50 as possible.  
You can jump forwards or backwards in jumps of 1 or 10 or 100.

Compare your strategy with a friend.  
Did you jump forwards or backwards?  
Can you land on 50 exactly?  
How far from 50 were you?  
Could you do it another way?  
Could you get even closer?  
Which numbers can get you to 50?  
Which can't?

Roll the dice again and have another go!

# Primary Curriculum Map



## NRICH <http://nrich.maths.org> Problems Linked to the Primary National Curriculum for Mathematics in Years 3, 4, 5 and 6

NRICH tasks embrace the aims of the curriculum (problem solving, reasoning and fluency) as well as curriculum 'content' ([further information](#)). The stars indicate the level of confidence and competence needed to begin the activity. One star problems will be suitable for the whole class, two stars for the majority and three stars for those who like a serious challenge.

The activity listings now include what type of activity they are: games are indicated by 'G', problems by 'P' and investigations by 'I'.

**N.B. This is work in progress – we would really appreciate your comments. Please email [emp1001@cam.ac.uk](mailto:emp1001@cam.ac.uk)**

Year 3	Year 4	Year 5	Year 6
<b>Strand 1 – Number</b>			
Count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number NRICH: <a href="#">How Would We Count?</a> * P	Count in multiples of 6, 7, 9, 25 and 1000	Read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit	Read, write, order and compare numbers to 10 000 000 and determine the value of each digit
Recognise the place value of each digit in a three-digit number (hundreds, tens, ones) NRICH: <a href="#">Coded Hundred Square</a> * P NRICH: <a href="#">Which Scripts?</a> * P	Find 1000 more or less than a given number	Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000	Round any whole number to a required degree of accuracy
Compare and order numbers up to 1000	Count backwards through zero to include negative numbers	Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers through zero NRICH: <a href="#">Tug Harder!</a> * G NRICH: <a href="#">Swimming Pool</a> * P NRICH: <a href="#">Sea Level</a> * P I	Use negative numbers in context, and calculate intervals across zero NRICH: <a href="#">First Connect Three</a> * G P
Identify, represent and estimate numbers using different representations	Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens and ones)	Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000	Solve number and practical problems involving all of the above NRICH: <a href="#">Round the Four Dice</a> * P I

# Reach 100

► <http://nrich.maths.org/1130>

Here is a grid of four "boxes":


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

# Links to National Curriculum Strands

- ▶ Use estimation to check answers to calculations and determine in the context of a problem, an appropriate degree of accuracy.

# Fluency

## Fluency

- Circle the odd one out:

$$345 + 452 = 800$$

$$691 + 113 = 800$$

$$368 + 482 = 800$$

- Hannah goes to the shop. She has got a £5.00 note. As she goes round the shop she estimates how much she has spent to make sure she has enough money. Below is a list of what Hannah bought.

Estimate what she has spent.  
Has she got enough?

Chocolate bar- 79p  
Can of pop- 65p  
Magazine- £1.50  
Crisps- 45p  
Puzzle book - £1.80

Would it be better for Hannah to overestimate or underestimate her answer? Explain why.

# Reasoning

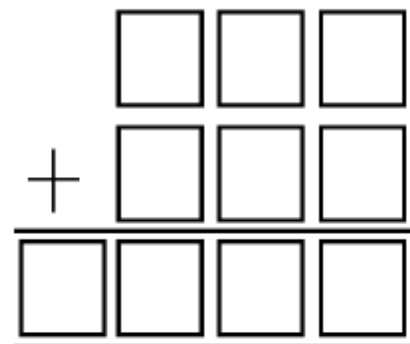
## Reasoning

- Do the following estimates sound correct?  
Explain your reasoning.
  - Last month the energy costs in my lab were £560. I estimate that my energy costs per year will be £7000.
  - Today I ate a 30g packet of crisps at morning break time, as I always do, so I estimate that I eat almost 11kg of crisps a year.
  - My round trip to work each day is about 22 miles, but I can claim mileage from work. I estimate that I can claim for 8000 miles each year.

# Problem Solving

## Problem Solving

- Play this game in pairs.  
Use the addition grid, the aim is to make a total as close to 1000 as possible.



Take turns to throw the dice and decide which of your cells to fill. This can be done in two ways: either fill in each cell as you throw the dice, or collect all your numbers and then decide where to place them.  
Whoever has the sum closest to 1000 wins.

# Game of Pig - Sixes

► <https://nrich.maths.org/1258>

PIG - Sixes - A game for two players, using two dice.

The winner is the first player to get **100** or more points.

You both start with zero points and take turns to throw the dice

as many times as you like adding the total at each throw to your score.

Throwing one **6** ends the turn and nothing is added to the score for that turn.

Throwing a double **6** ends the turn and the total score goes back to zero.

Try playing against Piggy. Can you work out Piggy's strategy?



# Gap Task

- ▶ Use the 5 big ideas and links to Reasoning and Problem Solving. Take any NRICH activity - explore the **Reasoning** in the activity. Note down the conversations the children have and the difficulties they experience.
- ▶ Next time we will reflect on how easy this was.
- ▶ Case Study.



# JIGSHAPES!

