



Embedding Problem Solving Day 1- Thursday 20th October

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Aims of the Programme

- To explore ways of integrating problem solving into the primary mathematics curriculum.
- To support teachers in nurturing confident, resourceful and enthusiastic learners of mathematics in their schools.

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Day 1 of 6

An NRICH introduction to:

- Rich tasks
- Problem-solving skills
- The teacher's role in a problem-solving classroom

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Session 1 Rich Tasks

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Magic Vs (6274)

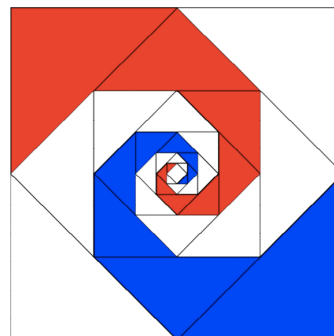


1. Place each of the numbers 1-5 in the V shape so that the arms of the V have the same total.
2. How many different possibilities are there?
3. How can you convince someone that you have found them all?

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Baravelle (6522)



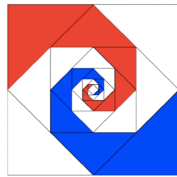
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Magic Vs / Baravelle

What's the same and what's different?



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Low Threshold High Ceiling

- Suitable for whole range
- Low entry point
- Lots of choices in
 - method
 - response
 - recording
- Learners can show what they **can** do, not what they can't
- High 'finish' possible

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Rich Tasks

- Have a relatively closed start but offer different responses and different approaches
- Invite own questions
- Combine fluency and reasoning
- Reveal/provoke generalisations
- Encourage collaboration and discussion
- Are intriguing
- May be accessible to all (LTHC)

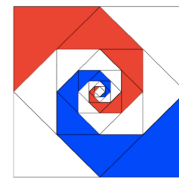
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Magic Vs / Baravelle

LTHC

Rich



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Further NRICH Support

- Article 'What's the Difference Between Rich Tasks and Low Threshold High Ceiling Ones?'
<https://nrich.maths.org/10345>
- Low Threshold High Ceiling Feature
<https://nrich.maths.org/8769>

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Reflection

- What would you like to develop from this session to impact back at school?
- What questions do you have?

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Session 2 Problem-solving Skills

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Key Problem-solving Skills

- Trial and improvement
- Working systematically
- Pattern spotting
- Working backwards
- Reasoning logically
- Visualising
- Conjecturing

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Two-digit Targets (6343)

You have a set of the digits from 0-9.

Can you arrange these digits into the boxes to make five two-digit numbers as close to the targets as possible? You may use each digit once only.

largest even number

largest odd number

smallest odd number

largest multiple of 5

number closest to 50

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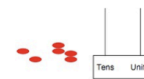


6 Beads (152)

If you put three beads onto a tens/units abacus you could make the numbers 3, 30, 12 or 21.



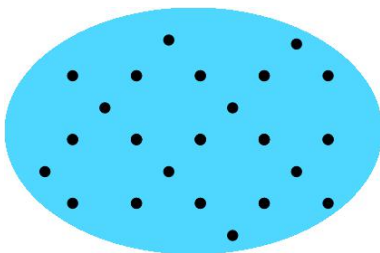
Explore the numbers you can make using six beads.



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How Would We Count? (8123)



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Money Bags (1116)

Ram divided 15 pennies among four small bags.



He labelled each bag with the number of pennies inside it.

He could then pay any sum of money from 1p to 15p without opening any bag.

How many pennies did Ram put in each bag?

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Key Problem-solving Skills

- Trial and improvement
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Further NRICH Support

Problem Solving Feature

<https://nrich.maths.org/10334>, including:

- Article 'Using NRICH Tasks to Develop Key Problem-solving Skills'
<https://nrich.maths.org/11082>
- Groups of tasks which will give learners experience of these key skills

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Reflection

- What would you like to develop from this session to impact back at school?
- What questions do you have?

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Reflective Journals

- Hand written or electronic
- Post-its as handy reminders
- For noticings and reflections
- To paint the picture in between PD days
- To supplement
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Reflective Journals

- What are you hoping to develop/gain support with throughout the year?
- Refer to your post-its from sessions 1&2
- Purpose is reflection and progress between sessions.
- Personal for you and an aide-memoire

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Session 3 The Problem-solving Classroom: The Teacher's Role

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"I have come to the frightening conclusion that I am the decisive element. It is my personal approach that creates the climate. It is my daily mood that makes the weather. I possess tremendous power to make life miserable or joyous. I can be a tool of torture or an instrument of inspiration, I can humiliate or humor, hurt or heal. In all situations, it is my response that decides whether a crisis is escalated or de-escalated, and a person is humanised or de-humanised. If we treat people as they are, we make them worse. If we treat people as they ought to be, we help them become what they are capable of becoming."

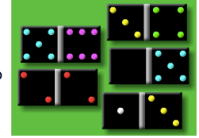
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Domino Sets (9965)

Stage: 2 ★

When you buy a set of 0-6 dominoes they often come in cardboard boxes - and those boxes sometimes don't last very long!
What if you were given lots of dominoes in a bag? Before you started playing it might be a good idea to find out if you have a full set!
How would you go about it?
How could you be sure?



What if someone gave you some 0-9 dominoes? How many do you think there would be in a full set?

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Amy's Dominoes (1044)

Stage: 2 ★ ★

Amy has a box containing ordinary domino pieces but she does not think it is a complete set.

She has 24 dominoes in her box and there are 125 spots on them altogether.

Which of her domino pieces are missing?



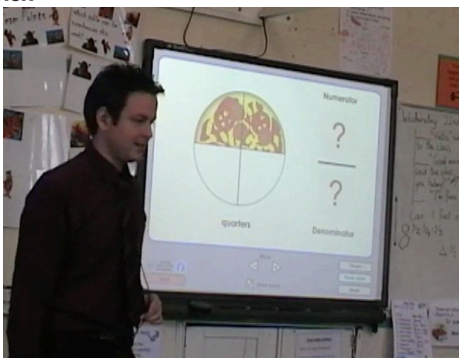
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Asking good questions

- This is a simulated 'observation' for which the focus is 'questioning'.
- Whilst watching the video, please note down reflections and questions for the teacher, to share after this 'observation'.

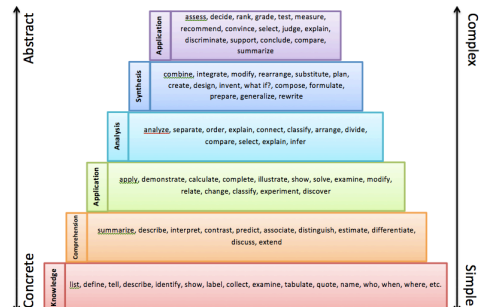
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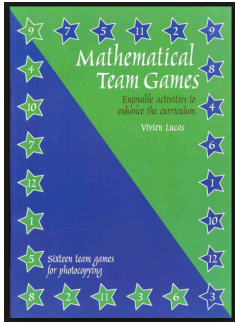
Bloom's Taxonomy Question Cues



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 **Magic Square**



Use the cards you are given to solve the problem they pose.


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 **Teacher behaviours**

- Write down any teacher behaviours you have noticed so far today, one per post-it
- Write down any other desirable teacher behaviours you can think of, also one per post-it

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STEM Events

Latest  **Problem Solving**
The feature details how NRICH can help you embed a problem-solving approach in your classroom.

Current  **Open Spaces**
In this feature, we have chosen to share some of the problems from the [Open Spaces](#) pathway on [Wild Maths](#).
Take a look at [Introducing Creativity in the Classroom](#) to find out more about Wild Maths, and for suggestions of NRICH tasks we recommend if you want to promote creativity in your classroom.
Here's how your learners can [send their solutions](#) to these problems.

Related
Consecutive Numbers
Plants
Train Carriages
Sweets in a Box

 **Circles, Circles Stage: 1 and 2 ***
Here are some arrangements of circles. How many circles would I need to make the next size up for each? Can you create

Collections
Development
Meeting the Aims of the National Curriculum in England

Trending
Open for booking
Primary Mathematics Leaders' Day 13
Questions raised ...
Mastering Mathematics and Problem Solving
NRICH can help!
Problem Solving

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NRICH enriching mathematics


Home Students Teachers **Early Years** Primary Teachers Secondary Teachers Topics:


STEM Events


Early Years Foundation Stage Activities


Welcome to our set of EYFS resources. We have designed these, in partnership with our [Early Years practitioner partners*](#), to support you in developing the initial building blocks for mathematical thinking, reasoning and problem solving with your children. We know how crucial these building blocks are to children's later success in mathematics. All these resources link to the [Early Years Foundation Stage Framework](#).


 **Mathematical Problem Solving in the Early Years**
This article describes how the NRICH Early Years resources aim to further develop young children's natural problem-solving abilities in the context of mathematics.

 **Shopping**
Pirates shopping for treasure.

 **A Good Foundation for Number Learning for Five Year Olds?**
Stage: Early years and 1
This article, written by Dr. Sue Gifford, evaluates the Early Learning Numbers Goal in England, in the light of research.

 **Tidying**
Using tidying up as a context for number work.

 **Early Years Activities Format Explained**
Why we've written what we've written...

 **Baskets**
Sorting objects into baskets.

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Increasing Wait Time from 0.9 to 3+ seconds...

1. The length of student response increases (300-700%)
2. More responses are supported by logical argument.
3. An increased number of speculative responses.
4. The number of questions asked by students increases.
5. Student – student exchanges increase (volleyball).
6. Failures to respond decrease.
7. 'Disciplinary moves' decrease.
8. The variety of students participating increases. As does the number of unsolicited, but appropriate contributions.
9. Student confidence increases.

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Categories of Wait Time

1. Post Teacher Question
2. Within student response
3. Post student response
4. Impact pause time

Wait Time: Slowing Down May Be A Way Of Speeding Up
Journal of Teacher Education 1986
Mary Budd Rowe

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What will you take away from the afternoon that will impact on what you do back at school?

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Feed Forward Planning

- Talk to the colleague from your school about how each of you will implement some of today's content in your classroom
- Explore the Teachers' Resources on the NRICH site for each task you plan to use

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Teacher Takeaway

- Putting planning into action in your classroom
- Read section of Mathematical Mindsets
- Refer to nrich.maths.org/towerhamlets

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References

- [NRICH \(id numbers\)](#)
- [Blooms taxonomy article \(5826\)](#)
- [Vivian Lucas \(2003\) Mathematical Team Games](#)
- [Radio clip \(Radio 4 The Educators: The World's Best Teachers 15/12/15\)](#)
- [Ruthven K \(1989\) \(linked on page below\)](#)
- [Haim Ginott \(1975\) Teacher and Child](#)
- nrich.maths.org/towerhamlets

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