Problem solving unpacked
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NRICH team
Aims

• To explore how to provide rich problem-solving experiences for all students.
• To understand how to plan effective and engaging lessons based on rich tasks.
• To unpack the reasoning journey and consider strategies for supporting its progression.
Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding.

Key Stages 1, 2 & 3
Session 1

Rich Tasks: Promoting Mathematical Learning for All
Key questions

- What’s the difference between a LTHC task and a RICH task?
- What are the implications for classroom practice?
- How can we engage all learners in the problem-solving process?
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Dice in a corner (8586)
Which Scripts? (774)

Six numbers in five different scripts.
Can you decipher the scripts?
What are the six numbers?
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)
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
Session 2

Unpacking the problem-solving process
Types of Task

- Finding all possibilities
- Visual problems
- Logic problems
- Rules and patterns
- Word problems
Baravelle (6522)
Take 6 Numbered Cubes
coming soon on the website
The Problem-solving Process

- Stage 1: Getting started
- Stage 2: Working on the problem
- Stage 3: Going further
- Stage 4: Concluding
Problem-solving process

1. Getting started
   - try a simpler case
   - represent with model
   - draw a diagram
   - act it out

2. Working on the problem
   - visualise
   - work backwards
   - reason logically
   - conjecture
   - work systematically
   - look for a pattern
   - trial and improvement

3. Going further
   - generalise
   - verify
   - prove

4. Concluding
   - communicate findings
   - evaluate
One Big Triangle

Place the 9 small triangles in the big triangle so that the numbers on the touching sides add to 10.
The Tall Tower (2354)

Which way should you go to collect the most spells?
And which way to collect as few as possible?
Can you find a route that collects exactly 35 spells?
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.
How Would We Count? (8123)
100 Square Jigsaw (5572)
Session 3

Workshops

• Digging deeper into structuring a lesson
• Types of problems and problem-solving skills: how might these impact on classroom practice?
Maze 100  (91)

In this maze there are numbers in each of the cells. You go through adding all the numbers that you pass. You may not go through any cell more than once.

Can you find a way through in which the numbers add to exactly 100?
Totality (1216)
Reasoned Rounding (10945)
NRICH Support

Problem Solving Feature (Primary)
http://nrich.maths.org/10334

Roadshow activities by Key Stage
http://nrich.maths.org/11351
Session 4 Reasoning

Progression in reasoning:
- Describing
- Explaining
- Convincing
- Justifying
- Proving
Sealed Solution 1177

A set of ten cards, each showing one of the digits from 0 to 9, is divided up between five envelopes so that there are two cards in each envelope. The sum of the two numbers inside it is written on each envelope:

7  8  13  14  3

What numbers could be inside the "8" envelope?
Embedding a Problem-solving Approach

- What could you do relatively quickly?
- What needs more thought?
- Where do you hope to be by Easter?