Badger Maths

Problem Solving Book 2
For Year 6

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Contents:

INTRODUCTION

The aim of *Solve that Problem* is to provide a valuable resource for teachers to enhance the ability of Y6 pupils in maths problem solving. The materials in the book support the National Numeracy Strategy objectives and, in particular, address the widely recognised need for a greater emphasis on using and applying mathematics.

HOW THE BOOK IS ORGANISED

- The *Problem Solving Process* on page 4 outlines the essential broad strategies required for pupils at Key Stage 2 to solve problems in maths. It outlines a comprehensive 4-step approach which includes spending time on explaining methods and reflecting.

- The book is divided into six main sections, each dealing with problems which can be solved using a particular strategy. In each of these sections there is a page of teaching notes about how the strategy works, and three teaching examples which can be worked through with the whole class. These examples put into practice the 4-step approach to problem solving outlined in the first chapter, and include answers and extension activities.

- Each main section of the book includes five or six copiable problem solving task cards. Each of these pages consists of three illustrated problems to solve in the form of questions or activities. The problems, numbered 1 to 108, are presented at three broad levels to provide differentiation:

  Level A for pupils working below the national expectations.

  Level B for pupils working at the level of national expectations.

  Level C for pupils working above national expectations.

- There is also a Copymaster for each section with prompt questions to help children work through the book's 4-step approach to problem solving. This may be appropriate where children need extra help or reinforcement of the appropriate strategy.

HOW THE BOOK RELATES TO THE NATIONAL NUMERACY STRATEGY (NNS) AND NATIONAL CURRICULUM

- The chart opposite gives details of where each of the book's individual numbered problems fits into the NNS framework. Most of the problems obviously come under the framework's Problem Solving strand, although some references are included twice because they also fit into other categories such as Number Sequences or Measures.

- A small number of problems do not fit easily into an NNS topic and have been included under Puzzles or Real Life Problems.

- There are no references to the Calculations strand of the NNS since the book is primarily concerned with using and applying maths rather than the mechanics of calculation, although it must be stressed that pupils should be encouraged to talk about the methods they use to solve problems at every opportunity.

- The material in the book also addresses the Using and Applying/Problem Solving strands of each attainment target in the National Curriculum for maths at KS2.

USING THIS BOOK

The book is flexibly structured and designed to be used in several different ways:

- To help teachers teach effective strategies and approaches for solving problems.

- To resource individual NNS topics, such as Length or Ratio and Proportion, particularly where extra practice at using and applying maths is required.

- To provide differentiated practice at various problem solving strategies, e.g. drawing tables and using diagrams.

- For homework exercises or extra preparation for SATs and other maths assessments.

Copymaster Using Logical Reasoning

★ Understanding the problem
List the facts that will be important in finding the solution: ....

....

....

★ What do you need to find out?
What questions do you have? What are you uncertain about? Is there any unfamiliar or unclear language? ....

....

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★ Planning and communicating a solution
Will you work logically? In what order will you use the clues? Will you find one that can be used as a starting point and from which the others can be logically thought out? Will you use a grid to help visualise the clues? Will you use objects to stand for the people and places in order to help visualise the situation?

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★ Reflecting and generalising
Did the strategy work as planned? Will you be able to apply this method of problem solving to other similar problems? Would a different method have worked better for you for this problem?

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★ Extension
How can this strategy be applied to more complicated problems involving additional factors?

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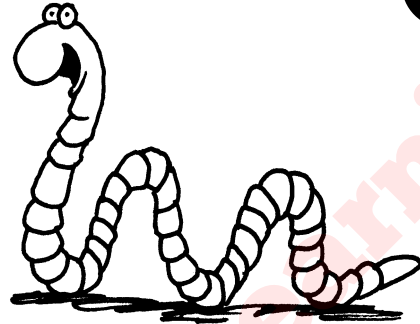...

Using Logical Reasoning

Problem 91 | Measures | Level A

In the story Harry was reading, a forever-hungry worm ate everything in sight. It ate so much that, incredibly, it doubled its size every day. If it took 11 days for the worm to be fully grown, how long did it take the worm to get to half its full-grown size?
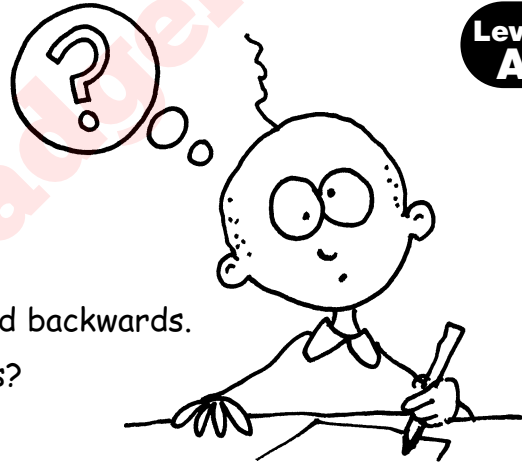
Problem 92 | Numbers 123 | Level A

There are three different numbers.

· They are all four-digit odd numbers.
· The digits of each number add up to 14.
· None of the numbers can be divided by 5.
· These numbers read the same forwards and backwards.

Can you guess the numbers using these clues?

Problem 93 | Numbers 123 | Level A

When Clarice opened her book, she saw two numbered pages. The sum of these two pages was 317. What would the next page number be?

Problem 94 | Numbers 123

Level A

I have 30 socks in my drawer and they vary in colour. I have 12 black, 10 blue, 2 brown and 6 grey socks. If I close my eyes and pull socks out at random, how many socks must I pull out before I can be certain to have a matching pair?
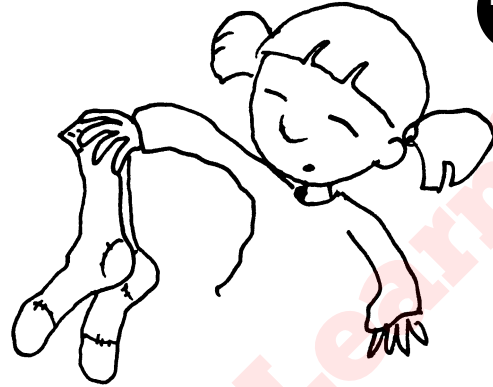
Problem 95 | Shape & Space

Level A

Rani wants to paint a cube so that no opposite faces are the same colour. What is the least number of paint colours she should buy?
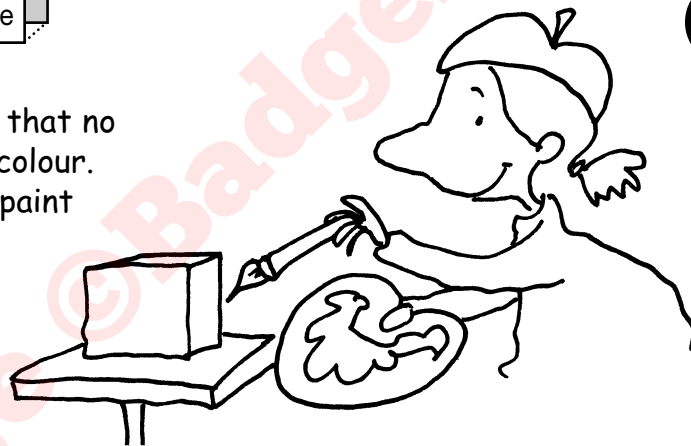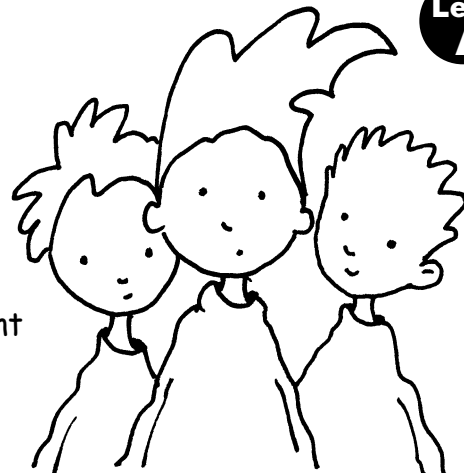
Problem 96 | Numbers 123

Level A

When Tristram, Evelyn and Carol leave school, they want to work in one of the following professions: as a teacher, an engineer or a computer programmer. None of them wants to work in a profession starting with the same letter as their name. Evelyn's mother is the aunt of the person who wants to become a teacher. What does each person want to become?

Problem 97 | Measures

Level B

Five pupils left their shoes in the changing rooms. Each wore the same brand of shoes, but in a different size. The shoes were sizes 2, 3, 4, 5 and 6.
Tensu knew that his were the smallest. Karen thought hers were bigger than Chan's but smaller than Deirdre's. Brad knew his were the largest.
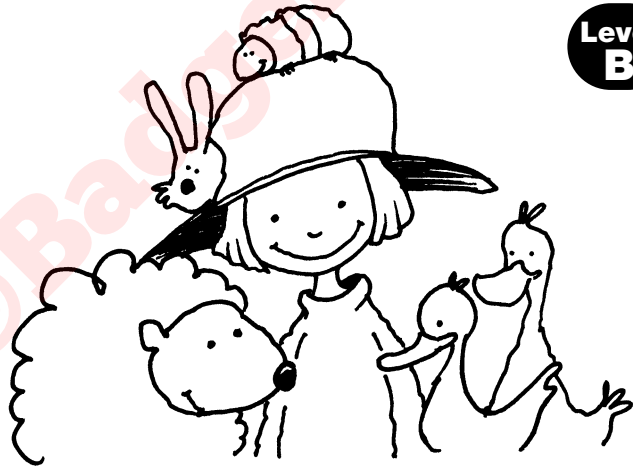Which size shoes did each pupil have?

Problem 98 | Numbers 123

Level B

There are 105 animals living on Farrelly's Farm. There are half as many rabbits as guinea pigs. There are half as many geese as sheep. There are three times as many geese as guinea pigs. How many of each farm animal are there?

Problem 99 | Measures

Level B

The pupils at camp hold a running race. Use these clues to work out their positions at the end of the race.

Peter was extremely fast and was the first boy to complete the race. Lisa came in just before Jonathan. Jonathan finished after Catherine. Michelle ran very well and managed to beat Catherine. Peter finished after Michelle but before Catherine.

Problem 100 | Shape & Space

Level B

Thomas and Trina help their parents with the chores at home. Complete a grid to show the order in which each completes their chores.

· Thomas vacuums the carpet after Trina dries the dishes.
· The person who cleans the bathroom does this first.
· The dishwasher is emptied before the mail is collected.
  Different people do these tasks.
· The last thing that Trina does is take the dog for a walk.
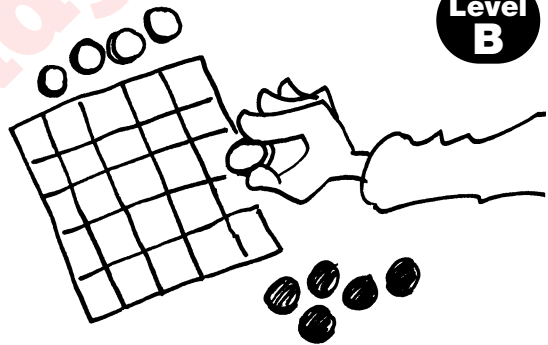· Trina does not walk the dog at the same time as the carpet is being vacuumed.
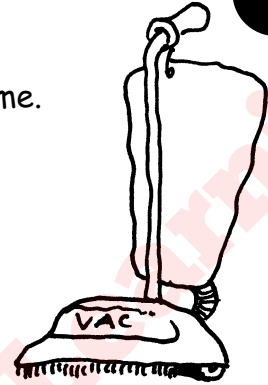
Problem 101 | Numbers 123

Level B

Draw up a five by five square chart. You will need five sets of coloured counters, with five of each colour. Place the coloured counters on the chart so that there is one of each colour in each row, column and diagonal.
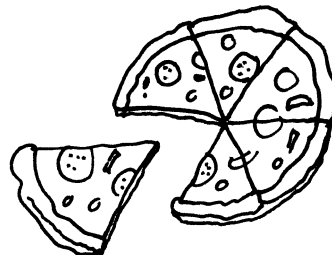
Problem 102 | Numbers 123

Level B

Carter, Jackie, Despina and Fred ordered pizza slices. They could choose from peperoni, vegetarian, anchovies and cheese. Match each person with the pizza they ordered.

· Carter hates all seafood.
· Jackie can't eat milk products.
· Despina loves meat.
· Fred is a vegetarian.

Problem 103 | Numbers 123

Level C

Carmen bought five tickets to watch a game of football with her friends. The tickets were numbered in order. When the numbers are added together, they total 110. What were the ticket numbers.

FOOTBALL
ADMIT ONE

Problem 104 | Numbers 123

Level C

Five cars are in a race. Their numberplates are:

1733   5824   9762   6465   7525

· The car with the highest number finished last.
· When the digits in the numberplates of the cars that came first and second are added, they give the same total.
· The cars that came in third and fourth both have an odd number as the last digit.
· The cars that came in second and third both bear numbers that are multiples of five.

Use these clues to work out how the racing cars placed in the race.

Problem 105 | Numbers 123

Level C

Jennifer, Jackie, Tandi, Lindsay, Sara and Lesley are all shooters in different netball teams. Between them one Saturday they scored a total of 33 goals. Each girl scored a different number of goals and each girl scored at least one goal.

· Jennifer was the top scorer and scored three more than Jackie.
· Tandi scored one less than Lindsay but their total was the same as Jennifer's and Jackie's scores added together.
· Lesley beat Sara's scoring level but their scores together equalled the number of goals Lindsay had scored on her own.

Use these clues to work out how many goals each girl scored.