Ready-Ed
Publications

Ages 9-11 Years

PHOTOCOPY
MASTERS

BRAIN BENDERS

2

CHALLENGING MATHS PROBLEMS FOR PRIMARY STUDENTS

OUTCOME LINKED

Barry Brocas & Brenda Bicknell

Contents

Teachers' Notes

What is this book about?
This book contains twenty-eight photocopiable mathematical problems. The problems have been written and presented to suit a range of abilities and ways of thinking and learning in middle primary school. Problem solving is an important part of the mathematics curriculum and this book has been designed to help students become familiar with, and put into practice, a range of problem solving techniques. The strategies which this book encourages students to use and develop are: guess and check, looking for patterns, drawing pictures and modelling objects, listing and eliminating possibilities, filling in grids, using timelines and making assumptions and estimates and judging the reasonableness of them. The problems are also designed to highlight the importance of reading mathematical language carefully.

Why have we written this book?
We have both been primary school teachers and are aware of the kind of support materials that busy teachers need. Over the years, we have collected the mathematical problems that appear in this book, and have shared many of them with our peers. It is their promptings that have brought about the publishing of this collection. The problems that appear in this book will add flavour and interest to a mathematics programme. They can create discussion and debate and stimulate mathematical thought. It is our belief that children exposed to such problems as the ones in this book, will develop greater powers to solve problems, investigate information and make decisions inside as well as outside the classroom. Most of these problems do not have immediately obvious answers. Their solutions might well include group discussion, or time to think them over at school or at home.

What is different about this book?
In spite of the fact that the types of problems that we have published have existed for a long time, are enjoyed by children and are an integral part of the curricula, it seems that not all teachers are using them. We think that one of the reasons for this is that they have not been made available in a 'ready-to-use' format. We have published this book in what we believe is a 'ready-to-use' format: using large print for creating overhead transparencies, mainly limiting one problem to one page, and providing answers which focus on the step-by-step methods which children are likely to use to solve the problems. We are aware that there are more sophisticated and sometimes shorter explanations of answers to some of the problems, but we have chosen to explain the answers in ways that we think children will best understand them.

How might you use this book?
Teachers can use these problems in a variety of ways. Some teachers have found it effective to give their students a problem at the end of a mathematics lesson as a starter discussion for the following day. Students are often sufficiently interested in the problems to discuss them at home. The most important thing for teachers to realise, is that if the problems are at the right level for their students, then they will not be solved immediately but will require some thought and possibly some discussion and debate. At the back of the book we have created a Brain Buster section which includes more difficult mathematical problems. You may use the problems which appear in this section as you wish. They could, for example, be used to extend more able students or to occupy fast finishers.
We hope that you and your students enjoy solving these problems.

Barry Brocas and Brenda Bicknell

The Jellybeans

Ainsleigh ate one hundred jellybeans in five days.
Each day she ate six more than she ate the previous day.

How many jellybeans did Ainsleigh eat on the first day?

| _____ jellybeans |

Hint: Use a guess and check approach. Guess how many she ate on the first day. Then adjust guesses accordingly.

The Eggs

If three hens will lay three eggs in three days, how many eggs will six hens lay in six days?

| _____ eggs |

Brain Bender 1

Answer ▶ The Jellybeans

✓ *Students should use a guess and check approach.*

One possible approach is to have a guess and adjust the figures until all five days total a hundred. For example, if a student guesses that Ainsleigh ate one jellybean on the first day, they will be thirty-five jellybeans short:

1 + 7 + 13 + 19 + 25 = 65

This is an average of seven jellybeans short each day. So seven should be added to each number to get:

8 + 14 + 20 + 26 + 32 = 100

So the answer is: Ainsleigh ate eight jellybeans on the first day.

Some more able students may be able to understand, if taught, that the middle number has to be the average of the five numbers, because the difference between consecutive numbers is constant. So the middle number must be twenty. It is then easy to reach the answer.
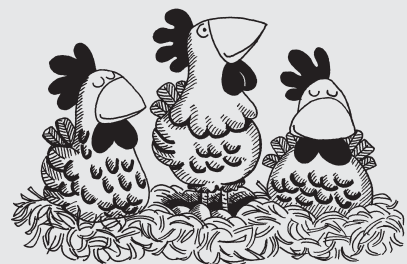
Brain Bender 2

Answer ▶ The Eggs

✓ *Students use computation to solve this problem.*

If only the number of hens doubled and the number of days remained the same, the answer would be six eggs – double the number of eggs.

But the six hens also have twice as much laying time.

So the answer is 12 eggs.

Animals in the Zoo
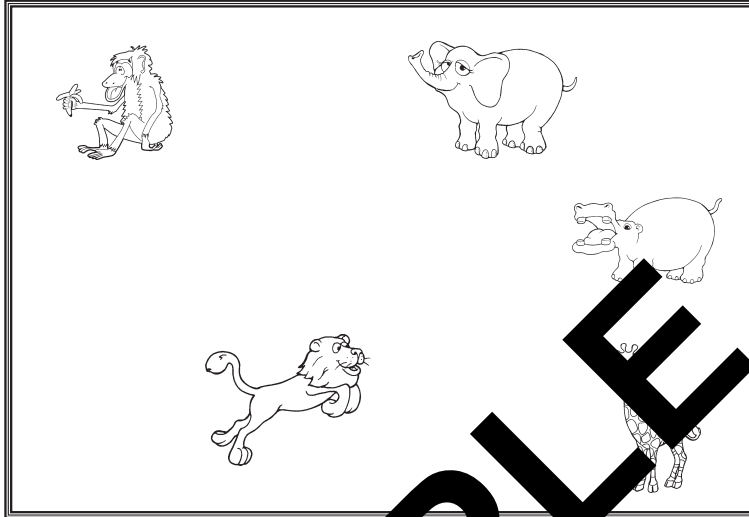
A small zoo has enough fencing to surround five animals but not enough to separate them. However, by digging three straight trenches, (drawing three straight lines on the diagram below) the animals can be separated from each other. The animals cannot move from their places as shown below.
Where could the trenches (lines) be placed?

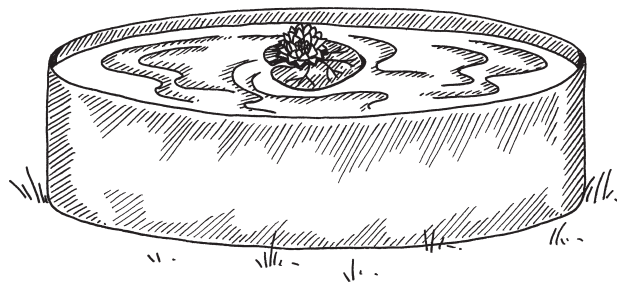*Hint: There are many possible solutions to this problem.*

The Lily Pond

A water lily on a pond doubles in size each week. If it takes ten weeks to cover the whole pond, how many weeks would it take to cover half the pond?
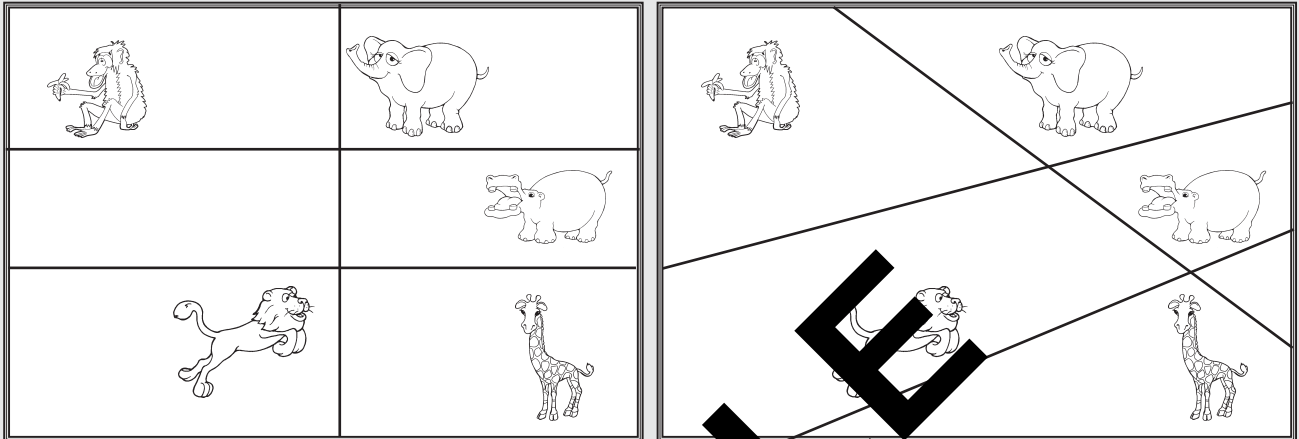
_____ weeks

Answer ▸   Animals in the Zoo

✓ *Students will arrive at a solution through trial and error.*

✓ *There are many solutions. Two possibilities are shown below.*

Answer ▸   The Lily Pond

✓ *Students work backwards to solve this problem.*

Since the water lily doubles in size every week and it covers the whole pond after ten weeks, it must have covered half of the pond after nine weeks.