Ready-Ed
Publications

Ages 10-13 Years

PHOTOCOPY
MASTERS

BRAIN BENDERS

CHALLENGING MATHS PROBLEMS FOR PRIMARY STUDENTS

3

OUTCOME LINKED

Barry Brocas & Brenda Bicknell

Contents

Teachers' Notes

What is this book about?
This book contains thirty-four photocopiable mathematical problems. The problems have been written and presented to suit a range of abilities and ways of thinking and learning in upper 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 will 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 of 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 a normal 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, there is a Brain Teaser section which consists of sixteen short mathematical problems, which can be solved quickly and used as warm ups to any lesson. In the middle 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

A Line of Stones

One hundred stones are placed in a line with a one metre gap between each stone. There is a basket at the end of the line that is one metre away from the first stone. Emily starts at the basket and aims to pick up each stone, one at a time, and place each one in the basket.

1. What distance does she travel to pick up and place one stone in the basket?

_____ metres

2. What distance does she travel to pick up and place two stones in the basket?

_____ metres

3. What distance does she travel to pick up and place three stones in the basket?
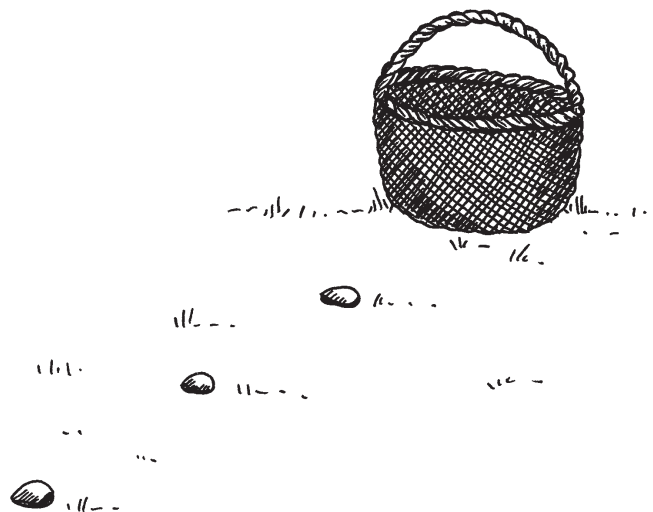
_____ metres

4. What distance does she travel to pick up and place four stones in the basket?

_____ metres

5. Can you see a pattern emerging? Can you use the pattern to work out the distance that Emily will have to travel to pick up all of the one hundred stones and place them in the basket?

_____ metres

Hint: drawing a time-line may help you work out the answers to the first four questions.
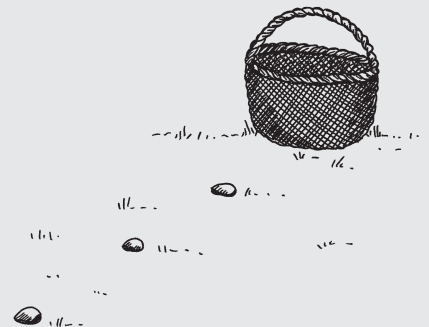
Answer ▶

A Line of Stones

✓ *Students should look for patterns to solve this problem.*

1. The distance to the first stone and back to the basket is two metres.

2. The distance to the second stone and back to the basket is four metres.

3. The distance to the third stone and back to the basket is six metres.

4. The distance to the fourth stone and back to the basket is eight metres

5. The distance increases by two metres each time an extra stone is picked up and placed in the basket. **So the answer is 200 metres**.

SAMPLE

Brain Bender 5

How do you rate this Brain Bender?
❏Brain Boring! ❏Easy on the Brain! ❏Brain Bending! ❏Super Dooper Brain Bending!

The Broken Vase

Four girls were having a pillow fight in the lounge when one of the girls broke a vase. Aunty Clare was a witness to the accident. Derryn's mother walked in and questioned the four girls. This is what they said:

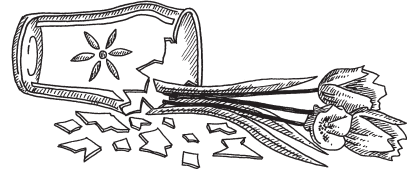| Alana said,	*"Derryn did it."*
Ainsleigh said,	*"I didn't do it."*
Derryn said,	*"Miriam did it."*
Miriam said,	*"Derryn lied when she said I did it."*

Derryn's mother asked Aunty Clare to say who had broken the vase. Aunty Clare always tells the truth but wouldn't say who had broken the vase.
Aunty Clare replied, *"Only one of the four girls is lying."*

Who broke the vase?

❏Derryn   ❏Miriam   ❏Alana   ❏Ainsleigh

ASSUMPTION: Ainsleigh is lying

	Broke the vase
Derryn	
Alana	
Ainsleigh	
Miriam	

ASSUMPTION: Miriam is lying

	Broke the vase
Derryn	
Alana	
Ainsleigh	
Miriam	

ASSUMPTION: Alana is lying

	Broke the vase
Derryn	
Alana	
Ainsleigh	
Miriam	

ASSUMPTION: Derryn is lying

	Broke the vase
Derryn	
Alana	
Ainsleigh	
Miriam	

Hint: Make four assumptions and check to see which assumption matches the information given. For example, first assume that Alana is lying, then Ainsleigh is lying, and so on. Use the grids to help you check your assumptions.

Answer ▶   The Broken Vase

✓ *Students should make assumptions and check their reasonableness to solve this problem.*

When students assume that Derryn is lying, they should arrive at the answer that **Derryn broke the vase.**