contents and sample pages

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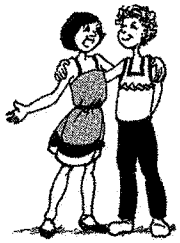
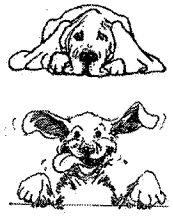
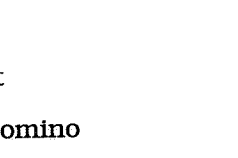
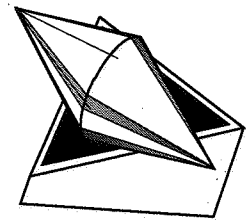








Introduction

The title

There is one experience which makes teaching mathematics worthwhile. A student asks concerning some difficulty, and while the explanation is being given, the student's eyes light up, and the light dawns. This is the 'Aha!' experience. It frequently occurs in problem solving when we realise that a newly tried approach is going to lead to the solution.

The problems

For centuries, mathematics teachers and lecturers have been trying to impart to their students their enthusiasm and love for their subject. There has, of course, always been a large component of mathematical content in this teaching, but over recent decades there has also been the hope that some of the logical deduction and reasoning associated with the subject might in some way transfer to other areas of life. I am not sure whether links have ever been established between success with the theorems and riders of Euclid, and survival in the trials of modern living!

However, in their wisdom, educational authorities have decreed that problem solving is a GOOD THING, and skills in problem solving have now been included as part of most school mathematics curricula. There is good justification for this move, but one of the negative aspects is that problem solving suddenly becomes a serious matter. Problems that students might once have gladly tackled 'for fun' now appear in text books, and are subject to examination. Because of time and space constraints placed on teachers and authors, the problems are often stripped of their context (which is often the most interesting part). They are graded for difficulty and placed in similar sets, and in the process, any role in 'training for life' gets completely destroyed.

The problems in this book were designed so that people might have fun and be entertained. They appeared as part of a three year series in the Adelaide newspaper, *The Advertiser*. Some have also since appeared in the journal *The Australian Mathematics Teacher*. They can be solved by the average layperson who likes to take up a challenge. They are not graded for difficulty, and with one exception, are not sequenced (Aha! 3 follows from Aha! 2). Their solution requires a wide range of simple mathematical and logical skills. However, this book has been designed so that these 'fun' problems might also be used as a means of learning problem solving skills.

Hints and strategies

This book is designed so that each problem appears on a right hand page. At the bottom of each such page is a bordered section entitled 'Hints and strategies'. Readers may like to cover up this section before reading the preceding problem. (This may take some will power!) In the section, ideas can be found for tackling the problem. This will avoid 'wasting' the problem when a reader cannot come up with an initial strategy. Incidentally, this suggests the value of making problem solving a group activity: someone suggests a good initial idea, and others take on the argument from there. Many companies use this approach to problem solving.

A course on problem solving will try to list possible strategies, classify them, and put them in order. Because there is such a great variety of problems, it is hard to devise a general plan. Polya suggested the plan: See, Plan, Do, Check. For the type of problems given here, you may like to distil out a more specific plan from the hints and strategies provided.

Solutions

For each problem, quite detailed solutions are provided over the page. The solutions briefly investigate different ways one might approach the problem — ways which may or may not be profitable. This is because few of us have minds that start with a problem and immediately follow a path which leads directly to the solution. Many problems are to be wrestled with, much as a dog wrestles with a bone, not letting the problem go until it submits. The given facts have to be assembled, but in the right way, and then some deduction made. Several false tracks may be followed, logical errors may need correcting, shortcuts may be

found. This analysis will take time. The model answers given in textbooks are usually the end product of such a process.

Extensions

Many years ago, Professor Paul Erdös visited the University of Adelaide. In a talk, he claimed that the secret of mathematics is to ask questions. Some questions we ask will be stupid, and will quickly be seen to be so. Others will have trivial answers. But every now and then we will ask a good question which will lead to a new and interesting problem. This is the basis of mathematical research, but it is also a technique which leads to much enjoyment in mathematics. It is one thing to find a solution to someone else's problem. It is quite another to be the inventor of a problem of your own!

The Extensions sections seek to lead the reader to explore new but related areas, to encourage the inquiring mind.

Conclusion

It may be that you read this book as an interested layperson. I had great fun preparing these problems; I hope you receive much enjoyment in solving them. But more than this, I hope that this book will be used as a resource book, to supplement texts on problem solving. But please not as an additional text! This is for fun, inspiration and challenge.

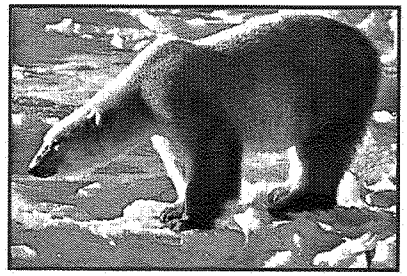
Acknowledgement

When does a problem become original? All the problems appearing in this book have been dressed in original clothes — some might say, heavily disguised! I gratefully acknowledge the basic ideas used here which originated — who knows where? — somewhere back in the long history of problem creation.

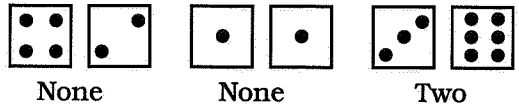
Paul Scott

AHA!

1. HOW MANY BEARS?



Here is an old puzzle you might like to solve and then try out on your friends. Mr Cleverwun tosses a pair of dice and asks "How many polar bears are there around the ice hole?" Here are some sample throws with answers provided by Mr C:



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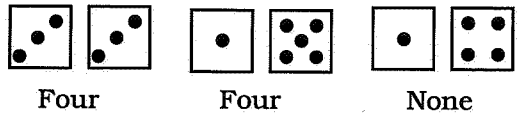
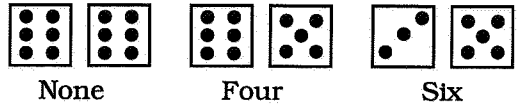


Four Four None



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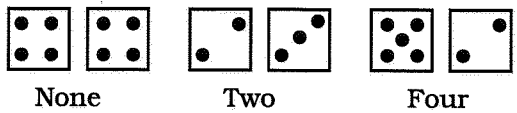
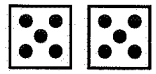


None Two Four

Now what about this throw? 

Hints and strategies

1. List the given information in a systematic way and try to spot a pattern.
2. Am I using all the information?