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PHOTOCOPY MASTERS

Problem Solving Series

Book 1

Strategies and techniques covering all strands of the curriculum, with activities to reinforce each problem solving method.

Ideal for students working at Intermediate Level.

For ages 9-10

Written by Val Morey. Illustrated by Terry Allen.

Published by Ready-Ed Publications (2004) P.O. Box 276 Greenwood W.A. Australia 6024
E-mail: info@readyed.com.au Website: www.readyed.com.au

ISBN 1 86397 462 8

Rationale

A learning outcomes approach to mathematics education means students and teachers need many and varied opportunities for students to demonstrate their learning and their understanding. To be as accurate as possible in determining students' current level of numeracy, those students must be given opportunities to demonstrate their understanding through activities which really show what they are able to do, as well as what they are not. Scoring 100% in a page of exercises tells teachers that a student has learnt what was taught, and can be useful information for checking that criteria have been met, but may not be a demonstration of their true or full mathematical understanding.

In order to make more accurate assessments of students' understanding, and therefore place them carefully within the levels described in the curriculum document, activities are needed which address two important aspects:

- Students must be able to show how well they can apply concepts or processes learnt to different contexts in order to solve a problem; and
- They must be given opportunities to show the "upper limits" of what they know and understand.

The approach in this book allows for both of those requirements.

At the same time, competence in mathematics should mean that students are able and willing to use mathematics in settings outside the math lesson. This book supports that by providing a wide, cross-curricular context for the activities it contains.

The activities provided in this book are based on realistic situations which school students of age 9 - 10 could expect to be familiar with or to face.

Therefore, the aim of having students *"able to deal readily and efficiently with common situations requiring the use of mathematics"* is addressed.

Contents

Teachers' Notes

This book contains a collection of activities for students aged 9 - 10 to enable them to develop their Mathematical problem solving skills. Strategies for solving problems are introduced individually and explained, so that these can be taught explicitly, practised and then applied to problems which relate to the students' school or life experience.

The book is devised as a course in mathematical problem solving and should be **worked through sequentially**, rather than "dipped into". It is divided into seven sections, one for each of the problem solving strategies to be taught. There is no need for teachers or students to have prior familiarity with any of the strategies presented. At the beginning of each section there is an explanation of the strategy to assist teachers and students, and then students are guided through a 'scaffolding' approach to eventual independence. Although the tasks become progressively more complex in each section, all students should be able to manage the initial example and thus become familiar with the strategy. Subsequent problems could then provide extension and/or enrichment activities which are meaningful and interesting.

Examples are provided for each of the learning areas of Number, Space, Measurement, and Chance & Data. Students are encouraged to work mathematically through the problem solving approach used, where students need to choose and use operations, make decisions about their "plan of attack" and strategies to be employed.

Related Standard

Students pose mathematical questions prompted by a specific stimulus or familiar context and use problem solving strategies which include those based on representing key information in models, diagrams and lists.

The activities provided represent excellent opportunities for teachers to see how students apply operational skills learned in mathematics and they would be ideal to use as part of an assessment portfolio if required.

Teachers may even wish to use these activities in curriculum areas other than Mathematics, as many of the problems could easily fit into a Social Studies, Health or Technology & Enterprise program, for example.

Teachers' Notes: Guess and Check

This strategy is an excellent way to introduce students to a problem solving approach to mathematics. Many of them will find that they have employed this strategy informally without recognizing it as such, and therefore it will seem familiar and within their "comfort zone". Validating "Guess and Check" as a method will be a terrific confidence boost and should help students feel able to approach the other strategies with a positive attitude. At the same time, the students will learn and practise sensible guessing and understand the importance of accuracy in the "check" part of the strategy.

As its name suggests, the students first of all guess an answer to the problem and then use that answer to check whether all requirements of the problem have been met. If not, then the answer is adjusted and checked again.

Teachers should stress that it is extremely unlikely that a student's "guess" is going to be correct – that is not the point – and that the guess provides a starting point, which is the key to all problem solving.

Student Information Page

When approaching problem solving, the main problem can often be figuring out "where to start"!

Sometimes the easiest and most sensible way is to simply take a guess at what you think the answer might be and then check to see if that's possible. You've probably done something like that yourself. If someone told you that there were twice as many blue chairs as gray chairs in your classroom, and that altogether there were 33 chairs, could you tell them how many blue and how many gray chairs there were?

You could soon find out by the "Guess and Check" method. Your guess is probably going to be closer than you think, although it's not likely it will be spot on.

❑ Firstly, think about what you know:

You know one number has to be double the other and that they both have to add up to 33. Therefore, the easiest thing to do would be to start with a number for the gray chairs, double it for the blue, and then see if they both add up to 33. So, you won't guess that there were 4 gray chairs, because then there must have been 8 blue, and together that makes only 12. Likewise, you won't guess 50 for the gray as that means 100 blue, which is 150 altogether. Already you have an idea of a range inside which the answer may lie.

It can be useful to draw up a grid, based on what you know, and then use it to help you find the solution. As you get the answer for each of your guesses, decide whether your number of gray chairs needs to go up or down.

Here is an example of how this could have been done:

1st guess	2nd guess	3rd guess	4th guess	Answer
8	14	10	12	Gray chairs 11
16	28	20	24	Blue chairs (double) 22
24	42	30	36	Total **33**

Related Standards:

Understands mathematic conjectures as more than simply a guess, makes straightforward tests of conjectures and discards those that fail the test.

Calculates with whole numbers, drawing mostly on mental strategies to add and subtract two-digit numbers and for multiplications and divisions related to basic facts.