

Preface

Problem Classes and Solution Processes

Book Designed For Parents and Students

This book is designed for use by parents and/or students who wish to teach or learn math problem solving in a homeschool setting — or who wish to supplement classroom instruction at home. Classroom teachers are referred to *Solving Math Problems - A Reference for Teachers*¹.

In this book, problems are organized into five distinct classes: pattern recognition, counting, ‘word’ problems, optimization, and recreation. The stress throughout the book is on the *processes* used to solve these five problem types.

The processes employed are listed below. Of course, the successful implementation of these processes requires detailed instruction and guided experience - hopefully provided by this book.

Problem Class	Solution Process
Pattern Recognition	Inductive Reasoning
Counting	Enumeration
‘Word’ Problems	Analysis
Optimization	Systematic Search; Graphing, and Calculus (optionan)
Recreation	Try, Test, Revise; All of the Above; Whatever Works

1. *olving Math Problems - A Reference for Teachers* is available through www.johndixonbooks.com. Please note that there is considerable overlap between that book and this one, especially in the example problems presented and solved.

Also, there are four ‘Supplementary Skills Units’ on supporting skills and knowledge helpful to math problem solvers:

Supplementary Skills Unit	Subject
A	Constructing Graphs
B	A Page of Triangles
C	Converting Units
D	‘Per’ Problems

Each chapter contains a test, and answers to the test problems are included. A section of References concludes the book.

It’s About the Processes

The problem *classes* in the first table above organize the central chapters, but the emphasis throughout is on solution *processes*. To the extent possible, we attempt to generalize and make explicit the solution process for each class of problems. The reason for this emphasis is that parents, if they are to teach well, should not only be capable problem solvers, but should also understand problem solving processes *explicitly*.

When teaching and learning problem solving, the solution processes are key.

Exercises and Problems

The problems in the book are not exercises. Instructions given for exercises (e.g., “solve for the roots”) make it clear exactly what is to be done. Problems, on the other hand, do not describe what is to be done to find the solution.

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Three Levels of Difficulty

Each of the five problem classes is treated at three levels of difficulty: easier, moderate, and harder. The three levels correspond roughly to grade levels as shown

Level of Difficulty	Grades	Book Part	Book Chapters
Easier	6 - 8	I	1 - 5
Moderate	8 - 10	II	6 - 10
Harder	10 - 12	III	11 - 15

The tables above and below show the organization of the book into Parts corresponding to the difficulty levels Easier (Grades 6 - 8, Moderate (Grades 8 - 10), and Harder (Grades 10 -12). The table below also shows the solution process used for each of the problem types.

Important: Try Problems *Before*

Looking at Solutions

There are over two hundred example problems in the book ranging from easy to moderately difficult. Except for the Introduction and tests, all problems come, not just with answers, but with detailed solutions that stress the solution process.

The solution processes for some of the examples follow immediately after the problem statement. It is strongly recommended that all readers devise a cover shield (paper or light cardboard) with which to cover these solutions while the problem is attempted on separate paper. It is far too easy to look at a solution and say 'Oh, sure, I could have done that' than it is to actually do the solution. Learning comes from thinking through the process — and doing it.

Do It Yourself Examples

Some solutions are not with the problem statement, but at the end of the chapter. The intent is to make it a bit easier for readers to try problems before seeing the solutions.

Problem Classes	Solution Process	Easier Part I	Moderate Part II	Harder Part III
Pattern Recognition	Induction	Chapter 1	Chapter 6	Chapter 11
Counting	Enumeration	Chapter 2	Chapter 7	Chapter 12
Word Problems	Analysis	Chapter 3	Chapter 8	Chapter 13
Optimization	Search, Graph Calculus Optional	Chapter 4	Chapter 9	Chapter 14
Recreation	Whatever Works; Try, Test, Revise; Combinations	Chapter 5	Chapter 10	Chapter 15
Constructing Graphs (Unit A) Some Triangles Unit B Converting Units (Unit C) and Per Problems (Unit D)		Supplementary Skills Units A and B	Supplementary Skills Units C and D	References