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PHOTOCOPY MASTERS

Math Problem Solving Techniques

SAMPLE

Eight problem solving strategies and practice activities for 9 to 12 year olds.

(Uses both customary and metric measurements.)

Written by David Stephenson. Illustrated by Rod Jefferson.
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Problem Solving

Problem solving should be approached as a challenge to achieve a workable solution. A good problem solver has the innate or learned ability to internalize problem solving techniques and sub-skills. When faced with a problem, real or abstract, he or she can then consciously select the most appropriate skill or skills to solve the problem.

Some people are said to be “born problem solvers” just as some people are “born athletes”. While this may be true, our experience has also shown that students can markedly and dramatically improve their ability in problem solving after they have worked through, applied and practiced the skills presented in this book.

Of greater concern is that, as educators, we are often indifferent to the variety of processes that can be used to arrive at the correct solutions. Students come into the educational setting possessing different sub-skills, different mental processing patterns, even a different perception of their own ability to solve problems. Students need to be provided with the encouragement to try different approaches, and the opportunity to fail without censure and retribution. It is only by the ongoing trial of probable solutions that correct/best answers can be located. Encouraging this experimental approach is the greatest assistance that can be provided to a student.

Good problem solvers have experienced early success and encouragement, thus reinforcing their belief in themselves as ‘good problem solvers’. Generating encouragement and reinforcement that students are good problem solvers can lead to surprising results. After all, “you are what you think you are”.

Overview of the Problem Solving Techniques

This book has been created to assist educators faced with the difficult task of presenting, explaining, teaching, and practicing problem solving techniques and skills.

This book provides:

a) a brief overview of eight problem solving techniques. Each technique is accompanied by a worked example that teachers should talk through with the class to give a full explanation of the sub-skills and thinking processes through which students may proceed. We realize that there are many more problem solving techniques than those presented here, and that problem solving techniques are never used in complete isolation. However, for the purpose of teaching we have broken the techniques into separate usable approaches to problem solving.

b) four practice questions with each of the eight techniques. These should be used as teaching exercises, changing the numbers as required to consolidate the technique being taught.

c) a nongraded mixture of 100 different problems requiring use of the problem solving techniques. These can be chalkboarded, photocopied or pasted onto cards. Allow students to work through at their own pace, omitting problems initially if they feel ill equipped to solve them. Students can return to those problems later on as their repertoire of problem solving skills increases.

The ability to solve problems at whatever level of complexity provides the solver with an intrinsic sense of self-worth. As educators, we should provide as many opportunities as possible to raise students' self esteem - providing them with these eight techniques to solve problems is a great commencement point.

Happy problem solving!

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NAME .....

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100 Problems - Results/Comments

1		26		51		76	
2		27		52		77	
3		28		53		78	
4		29		54		79	
5		30		55		80	
6		31		56		81	
7		32		57		82	
8		33		58		83	
9		34		59		84	
10		35		60		85	
11		36		61		86	
12		37		62		87	
13		38		63		88	
14		39		64		89	
15		40		65		90	
16		41		66		91	
17		42		67		92	
18		43		68		93	
19		44		69		94	
20		45		70		95	
21		46		71		96	
22		47		72		97	
23		48		73		98	
24		49		74		99	
25		50		75		100	

Strategy 1
Making a Diagram

Making a diagram is a simple technique that is a good starting point in teaching problem solving. "Doodling" while you think is useful! Information is continually documented, which helps to keep track of all discoveries and see patterns which might not be immediately obvious.

There are two diagrammatic techniques which are especially useful:

a) Scaling - where the precise information can be converted to a scale diagram. Solutions can be determined by the size, shape, amount etc. indicated by the resultant diagram.

e.g. If this is 3 miles (or kms), how long is this? = 9 miles (or kms).

b) Sketching - where the information is arranged visually to produce a pattern and a possible solution.

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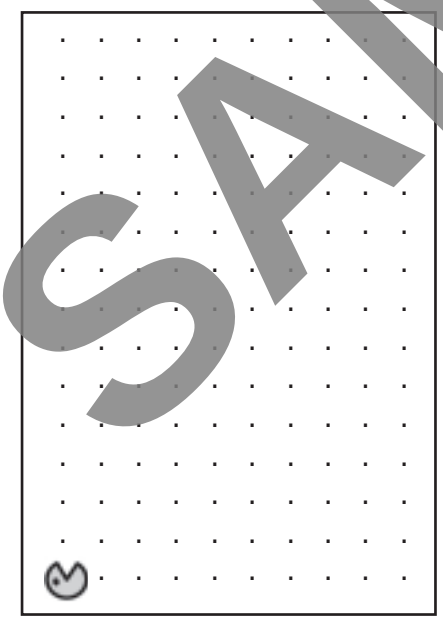
Example to work through

In a game of Pacman, there are 15 rows of 10 power points. Calculate the number of power points Pacman devours as he travels the following route from the start point: up: 3, right 2, up 6, right 3, up 4, right 1, down 9, left 6.
Describe how far away Pacman lands from where he started.



Teaching Strategies

★ Read all the problem through before commencing.
★ Do each instruction or step in isolation. Don't try to predict outcomes too prematurely.
★ Be specific as you answer the questions.

Working the Solution

★ 3 + 2 + 6 + 3 + 4 + 1 + 9 + 6 = 34
★ Ends four power points from the start.

Strategy 1: Making a Diagram - Practice Sheets

Practice Problem 1

At sunrise a sand flea began jumping up a 20 yard (or meter) sandhill. Every hour he was able to jump up five yards, but then slid back three yards in the loose sand. How long did it take the sand flea to reach the top?

Answer: _____ hours

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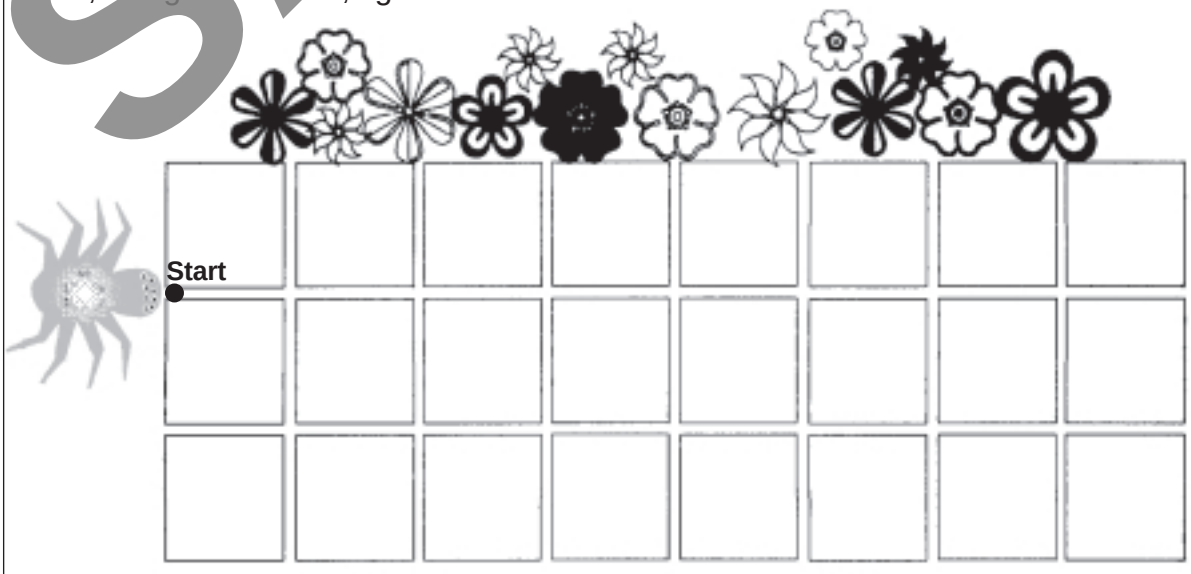
Practice Problem 2

'Scary' the superstitious spider only walks along the cracks in between the slabs on a sidewalk. If each slab is one yard (or meter) times one yards (or meter), how far would he travel if he went along two slabs, right one slab, along three slabs, left one slab, along three slabs, right two slabs and back five slabs?



Answer: _____ yards / meters