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About This Book

Any boredom in your maths class will quickly disappear when your students start tackling the pages in *Maths Mind Stretchers*. These puzzlers are certain to challenge even your brightest maths stars. (They may even challenge you!) While your students are solving these unique puzzlers, they will be practising valuable maths skills in most of the important middle years maths areas.

The book is designed to simplify your preparation and instructional time. Each section begins with a teacher resource page. Do not skip this valuable teaching tool! The resource pages give you important background information and sample problems to work through with your class. They make you the expert in explaining tricky problems to your students. Each student section is arranged by difficulty level beginning with the easiest pages. Always preview activities before assigning them. You will find that some are suitable for the whole class while others will be suitable only for your brightest pupils. A clear and complete answer key appears in the back of the book which also includes further explanations.

Topics covered in the book include Number Patterns which present work with whole numbers, positive and negative integers, fractions and decimals in fun formats. There are sections with Word Logic and Number Logic which involve critical thinking skills. Statistics and Probability give more practice in computational work and analytical thinking. The Geometry and Measurement section covers visualisation, formulas, metric units and other related areas. The book ends with Quick Thinkers, a unique collection of problems that develop students' abilities in listening, comprehension and mental computation.

The next time your students say, "There's nothing to do!" give them a challenge from the pages of *Maths Mind Stretchers*. You have a wealth of 'boredom beaters' right at your fingertips!

1 Number Pattern Puzzlers

Number patterns provide a fun way to enter critical thinking skills and computational practice into the maths curriculum. In the first seven puzzlers in this section, students are told exactly what patterns they are using. They need to work within the definition of each pattern to supply missing answers. In most cases, this requires students to do numerous mental calculations and estimations. Puzzlers that appear later in the section require students to identify and/or extend the number patterns.

Use these examples as 'warm-ups' to this section. Like the puzzlers, the examples become increasingly difficult.

Example 1: Place the digits 1-9 in a 3 x 3 square so that no digit has a smaller number to the right of it or below it. Try to write five 3 x 3 squares to fit this pattern.

Possible answer:

1	2	6
3	4	8
5	7	9

Did students find a shortcut? The top left number must always be 1 and the bottom right number must always be 9. 'Playing' with the placement of numbers is good practice for the first puzzlers in this section.

Example 2: Supply the next three numbers in each row. (Answers are in parentheses.)

- A. 1, 1.1, 1.3, 1.6, 2, 2.5 (3.1, 3.8, 4.6)
- B. 3, $2^{1/2}$, $2^{1/4}$, $2^{1/8}$, $2^{1/16}$ ($2^{1/32}$, $2^{1/64}$, $2^{1/132}$)
- C. -2, -3, 9, 8, -24, -25, 75 (74, -222, -223)

Patterns used: A. +.1, +.2, +.3, +.4...

B. $^{-1/2}$, $^{-1/4}$, $^{-1/8}$, $^{-1/16}$...

C. -1, x -3, -1, x -3...

A good first step in solving progressions like these is to find the difference between successive numbers (i.e., going from one number to the next using addition and/or subtraction). If a pattern does not emerge from this method, students should then try using multiplication and/or division. Also consider the possibility of a combination of operations as used in example 2C and progressive differences as in examples 2A and 2B.

Suggestions for Specific Puzzlers

Nine Square Dare

Trial and error is the method of choice here. Since no calculations are required, it is a good initial exercise in seeing patterns and experimenting with the placement of numbers.

Memory Patterns

This is also a good introduction to recognising and analysing number patterns. What could be a very simple exercise becomes quite difficult when completed from memory. Encourage students to study the patterns and sequences when looking at the chart and then attempt to answer the questions without 'peeking'.

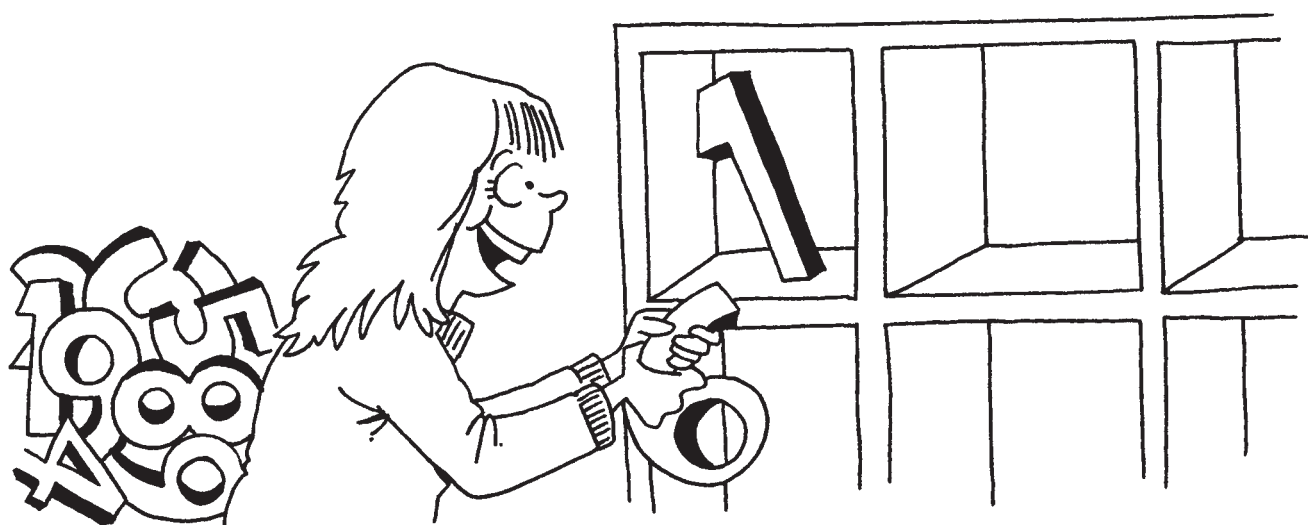
Name _____

Nine Square Dare

Place a number from 1 to 9 in each empty box so that these patterns are true:

1. Each number 1-9 appears exactly once in each row.
2. Each number 1-9 appears exactly once in each column.
3. Each number 1-9 appears exactly once in each smaller 3 x 3 square.

1				6		2		5
		3	5	7			1	
	9							
3				5			6	
		2	7			8		
	6						4	
		6	1		5			3
	3			8				
7							5	9



2 Word Logic Puzzlers

We first consider a common type of logic puzzle - one in which several clues are presented and the student must rule out certain possibilities to arrive at a correct conclusion. Working on puzzles like this helps students to think and work in an orderly manner, and it helps them to read carefully for detailed information. Both inductive and deductive reasoning skills are also developed through these activities. The puzzles in this section do not require any computational skills. For puzzles that combine logic with numerical operations, see Part 3, Number Logic Puzzlers. Show students how to solve this type of puzzle by using the following sample problem and the matrix shown here.

Ann, Bob, Cathy and Derek each work as a doctor, lawyer, teacher or farmer. Use the clues to find who has which job.

1. Cathy is not a teacher or a farmer.
2. Ann is either a teacher or a doctor.
3. Derek is not a doctor or a farmer.
4. The lawyer is a woman.

	Ann	Bob	Cathy	Derek
Doctor				
Lawyer				
Teacher				
Farmer				

Use an X in each square of the matrix that is not a possibility. Use an O when you know that something is correct.

In this problem, the clues are all very clear. Very little inductive reasoning is needed. After reading clues 1, 2 and 3, the matrix should look like this:

	Ann	Bob	Cathy	Derek
Doctor				X
Lawyer	X			
Teacher			X	
Farmer	X		X	X

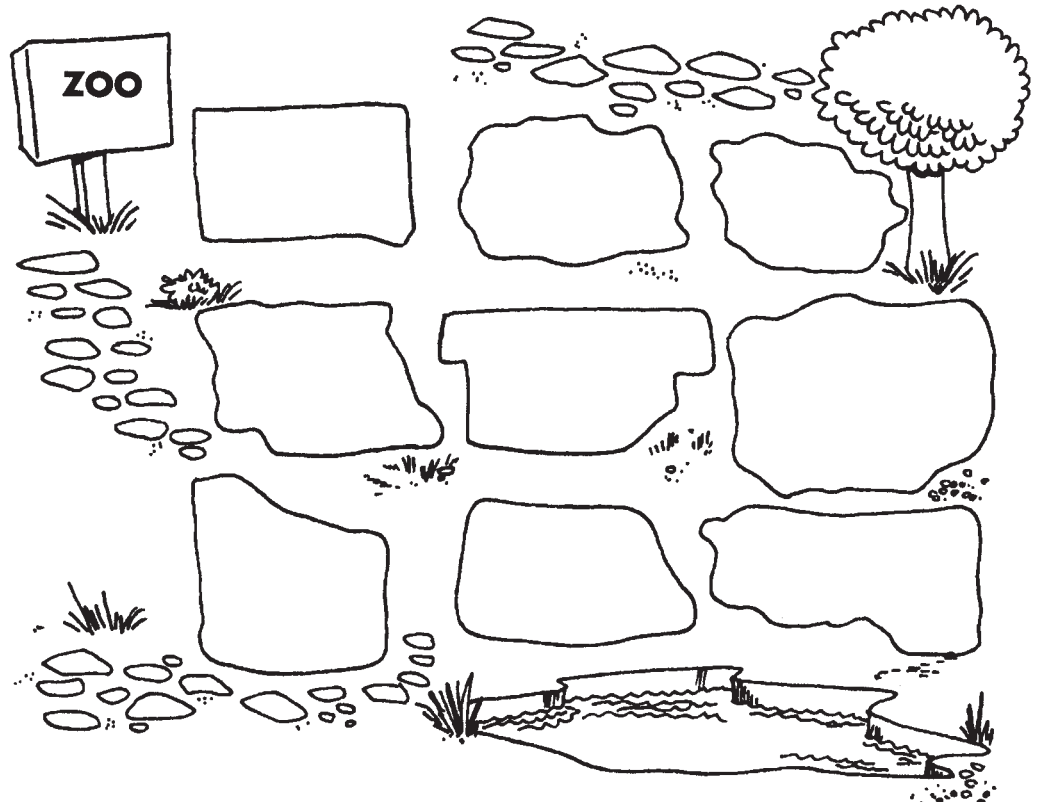
Before going on to clue 4, you notice that Bob has to be the farmer, since all other people have been eliminated for that occupation. So students should put an O in the box for Bob/Farmer and then enter an X in all other boxes under Bob's name. (Since he is the farmer, he cannot be the doctor, lawyer or teacher.)

A Zoo's Clues

The City Zoo is implementing a new plan for arranging its animals. The zoo's director, Ms Conundrum, has asked her staff to follow the guidelines below when placing animals in their new homes.

Animals

giraffe
hippopotamus
zebra
tiger
emu
lion
monkey
crocodile
elephant



Guidelines:

1. The zebra is to be placed directly west of the hippo.
2. The crocodile is allergic to the tiger, so the two must be placed as far apart as possible.
3. The emu should be north of the zebra.
4. The giraffe likes to be in the centre where he can see everything.
5. The hippo and the crocodile must be placed closest to the pond.
6. The lion should not be placed next to the tiger.
7. The monkey needs to be as close as possible to the trees.

Write your final solution on the diagram above.